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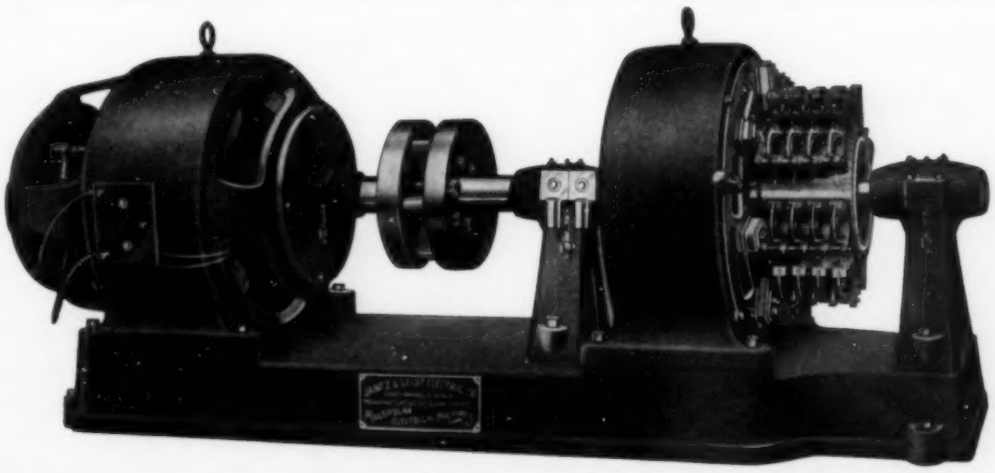

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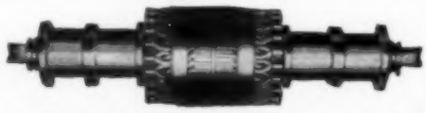

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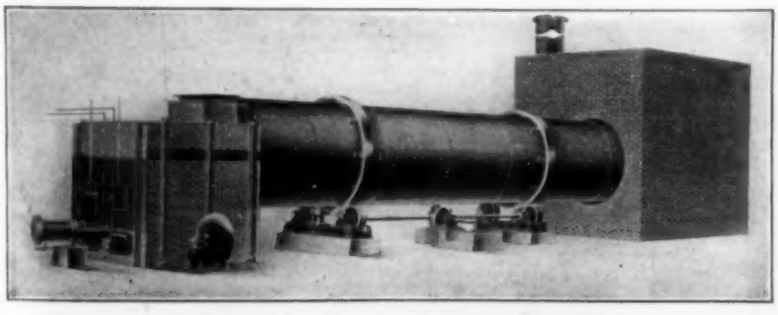

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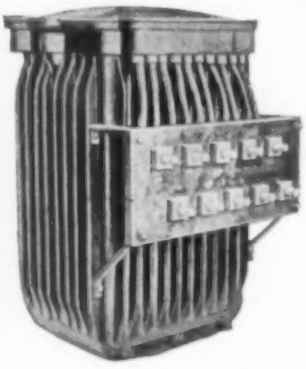

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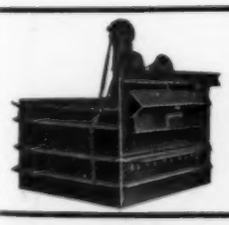

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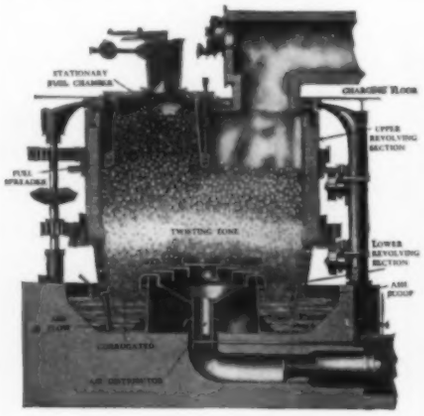

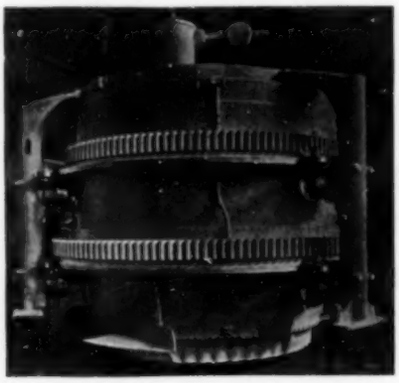

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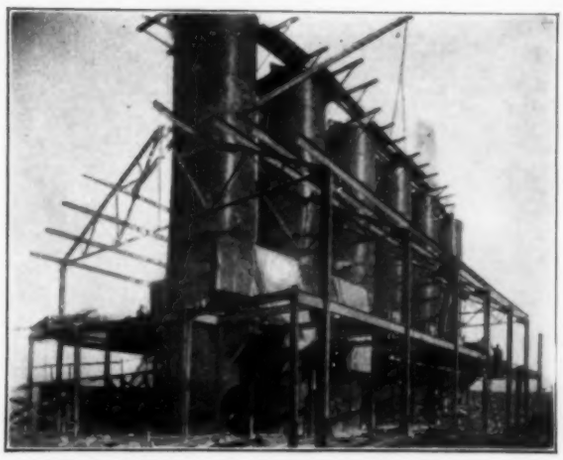

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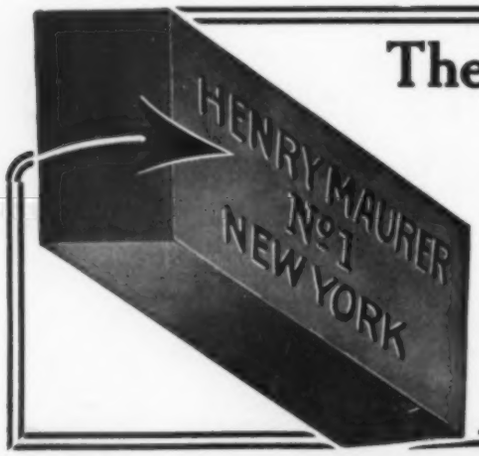

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How to obtain the best results from Crucibles for Tilting Furnaces

First—The crucible **must** be slowly and thoroughly dried or annealed and properly placed in the furnace, securing same so as to allow for the difference of expansion between furnace and crucible.

Second—It is necessary to disseminate the flame on its entrance into the furnace so that it does not train itself on any one part of the crucible, but completely surrounds it.

Third—Adjust your valves slowly and carefully so that no oil or gas goes into the furnace without being fully vaporized, and that nothing but the flame itself comes in contact with the crucible.

Fourth—Use

Bartley Crucibles

Bartley Crucibles resist to the utmost improper practice, **because they contain the Service factor in the highest degree.** Their records show lower yearly cost than any other crucibles. Our literature (sent on request) contains valuable facts regarding correct practice—of which the above is a sample—and will be sent upon request. It also shows our RETORTS, STOPPERS, etc.

Jonathan Bartley Crucible Company

Trenton, New Jersey, U. S. A.

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Diatoms
Greatly Enlarged

KIESELGUHR, also known as "diatomaceous" or "infusorial earth," is a natural siliceous material composed of the remains of myriads of microscopic flowerless aquatic plants known as "Algae." Its great value in the industrial world lies in the character of the cells of which it is composed. These cells vary in form and outline, but the general construction is that of infinitesimal dead air spaces surrounded by silica as shown in the microphotographs herewith.

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Extreme Porosity.
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Hardness of constituent particles.
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Light—Hard—Porous—Inert.

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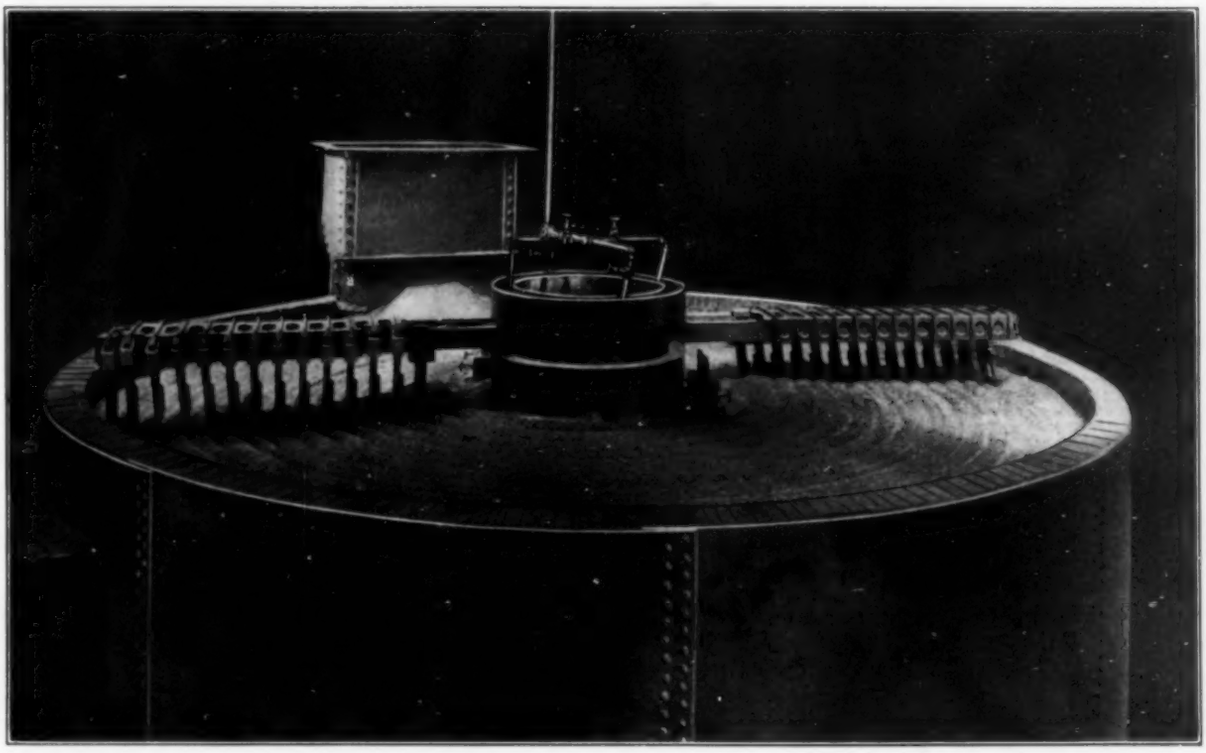
Metal Dryer Top

U. S. Patent No. 842,736

January 29, 1907



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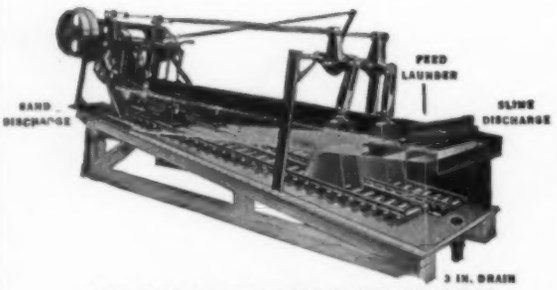
Write us, giving diameter (inside of shell), kind or make of roaster you are using, with sketch showing your feed hoppers and clearances. Also, please give average analysis (showing sulphur contents) of ore or concentrates you are roasting.

It may pay you to install a dryer top on your furnaces.

Wedge Mechanical Furnace Company

115 Chestnut Street, Philadelphia

PERFECT
Washing — Dewatering — Agitation
can be secured by using
DORR MACHINES



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(Patented)

The Dorr Classifier

Largely used for classifying desliming and washing ores in metallurgical work. The crushed pulp from stamps or other mills is handled by this machine, giving clean sand and slime at one operation. Applicable to any kind of material.

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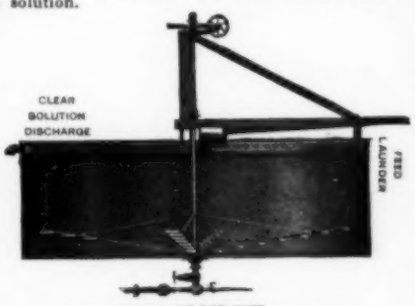

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By JOHN L. HOWARD, Boston Society of Civil Engineers

Journal of the Association of Engineering Societies
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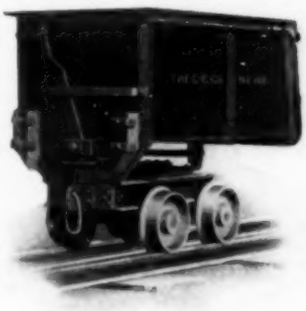

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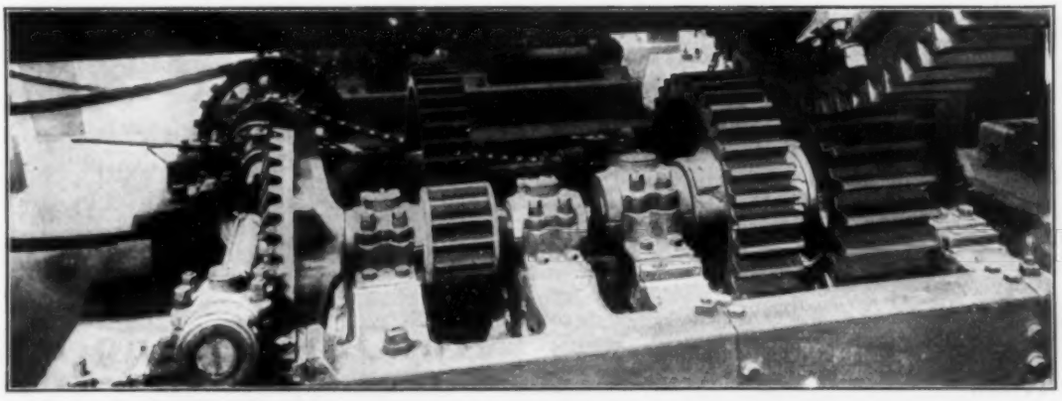

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The Vulcan principle of heavy cut-steel nodulizer gears is responsible for much of the success of these immense Vulcan products. The irregular, spasmodic resistance of their heavy contents, the vibrations set up by the internal rumbling motion, test the material and design of gears to the utmost. In Vulcan Kilns the shock is distributed to give the gears long life and allow uninterrupted burning in the kiln.

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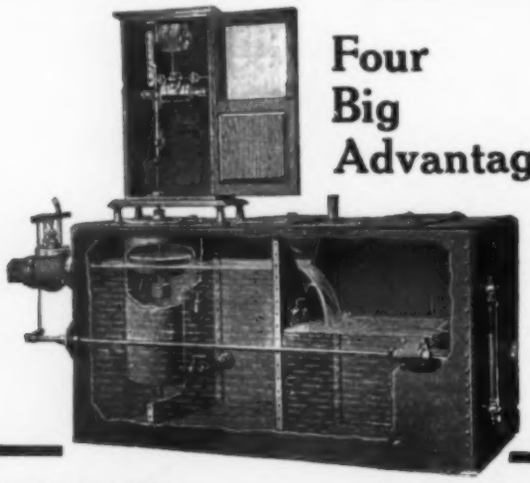

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Now, consider, the 600 or more patterns of

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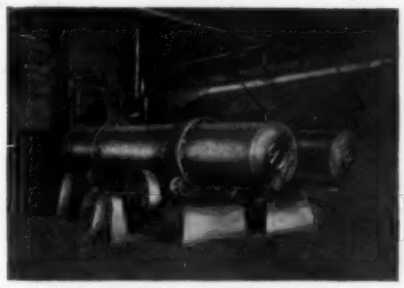

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Ruggles-Coles Engineering Company

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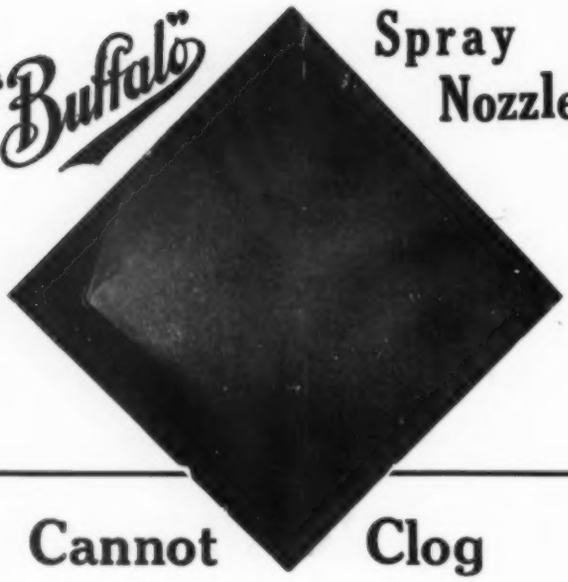
"Buffalo" Spray Nozzles



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The structure of the Spray is independent of the size of the orifice, allowing use of large discharge openings. Highly efficient results with minimum initial pressure. Lead, brass, monel metal or special composition nozzles supplied for chemical plants; details on request.

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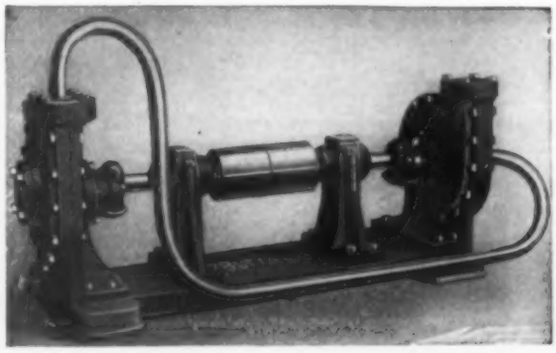

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Two kinds, hard and flexible.
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For use in connection with evaporators, dryers, vacuum pans, etc. Made in all sizes, for belt, motor or engine drive. This type has the advantage of being moderate in first cost, low in power consumption and absolutely reliable.
We also furnish complete steam condensing equipment.

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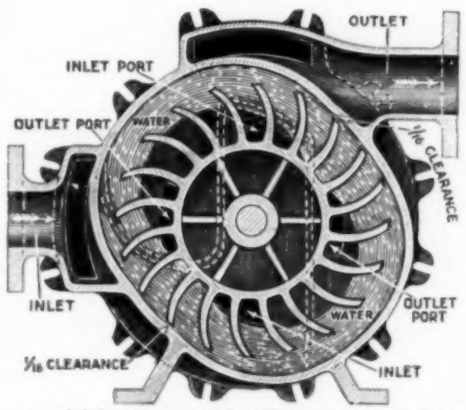

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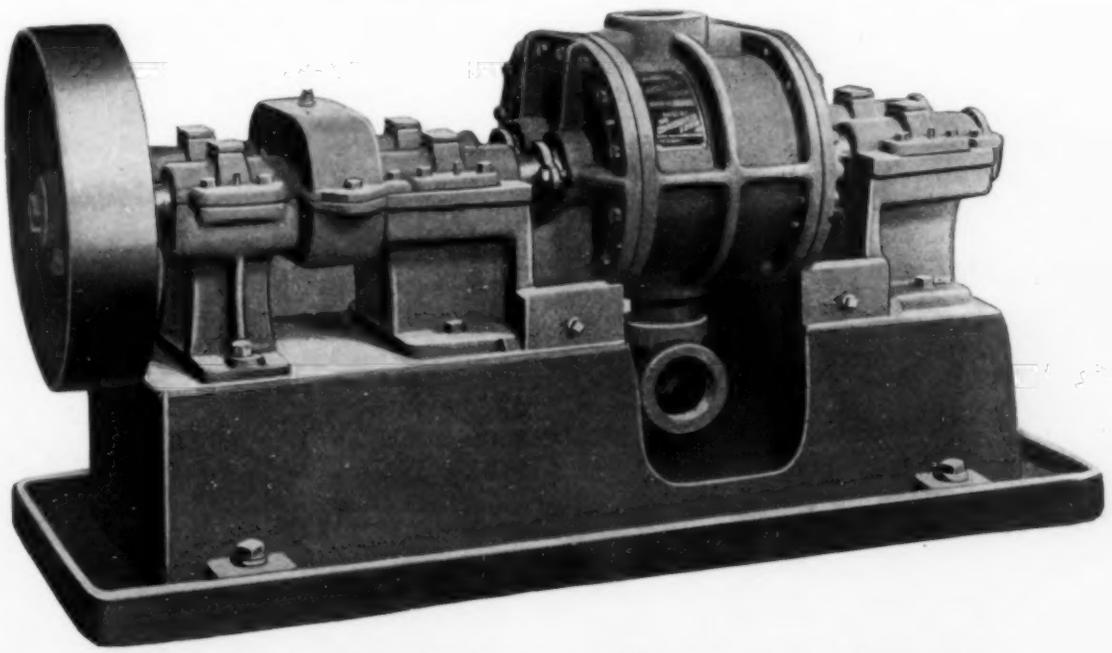

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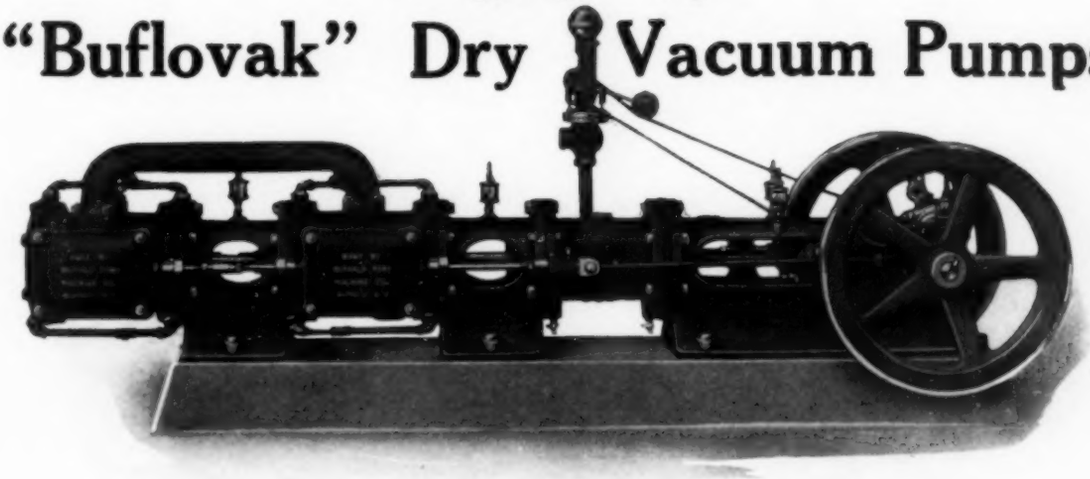

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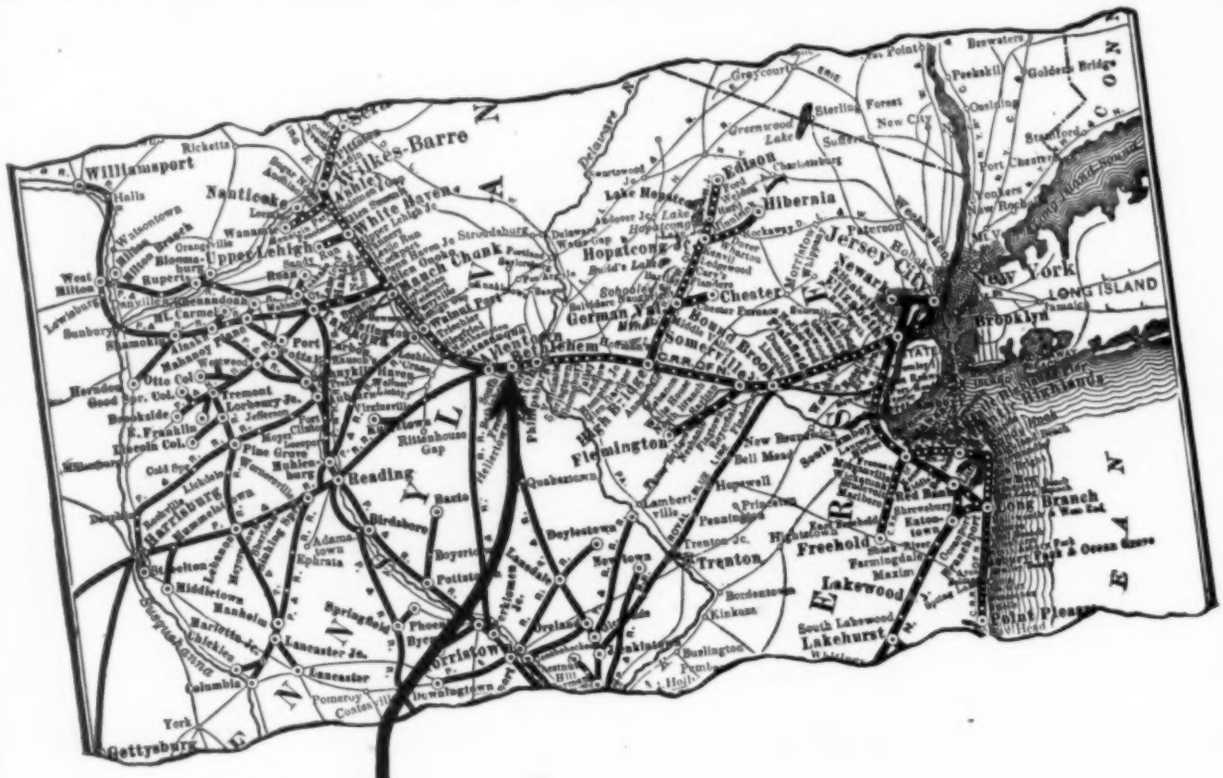

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A train of thought should arrive at a conclusion. Start at Bethlehem or for Bethlehem to investigate the origin of the best there is in iron and steel apparatus for chemical work.

Either way, you can't help arriving at the conclusion that "Bethlehem-Built" apparatus from South Bethlehem, Pennsylvania, deserves due consideration when next you are in the market.

Made only by

Bethlehem Foundry & Machine Co.

South Bethlehem, Pa. **New York Office: Singer Bldg.**

W. A. Wilbur, President **J. George Lehman, Vice-Pres. and Gen'l Mgr.**

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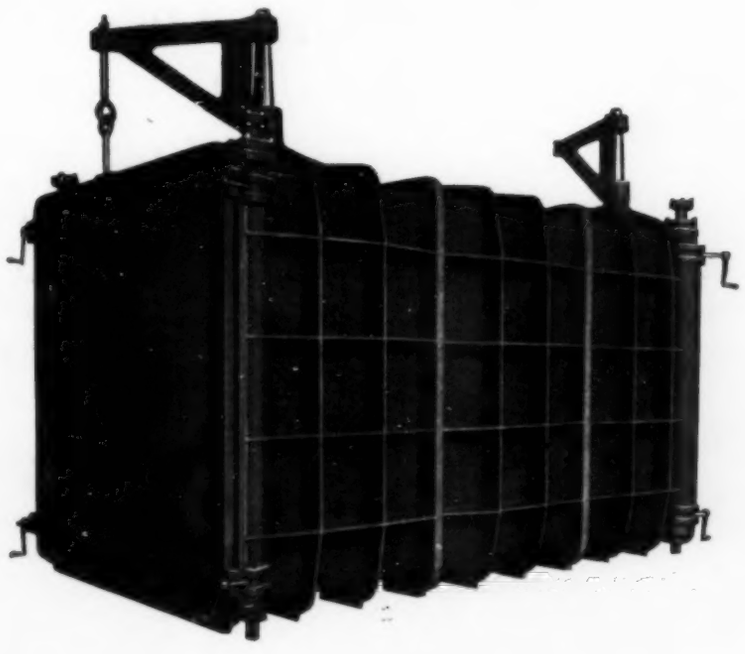
VACUUM DRYING AND EVAPORATING APPARATUS

For any requirement of the Chemical Industry



Our many **Repeat Orders** evidence the superiority of our Apparatus in design and construction, economy of operation and of the product obtained. For dependable Apparatus, write

J. P. DEVINE CO.

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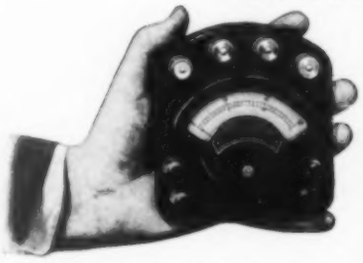
New Weston Miniature Precision Direct Current Instruments

Switchboard and Portable Ammeters, Voltmeters, Milli-voltmeters and Volt-ammeters

Masterpieces of the Instrument Makers' Art

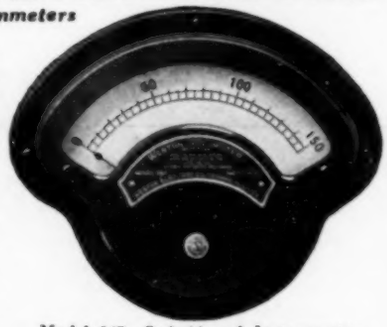


Model 280—Portable Instruments.

For their size, these Miniature Instruments have unusually long and, therefore, very legible scales. The instruments are very dead-beat, extremely quick in action, and sensitive. They possess the same general characteristics as the highest grade Weston Instruments. Indeed, these Miniature Precision Instruments are a typical Weston product. They are also inexpensive.

We are justified in commending these Weston Miniature Precision Instruments to all who desire good small direct-current measuring instruments, as being in every way suited for the numerous purposes in which lightness combined with compactness is essential or desirable.

We list nearly 300 different styles and ranges and carry an enormous stock of finished instruments and parts. Orders can be promptly filled, and the instruments can be safely transported by parcel post.



Model 267—Switchboard Instruments.

For full information, send for Bulletin No. 8

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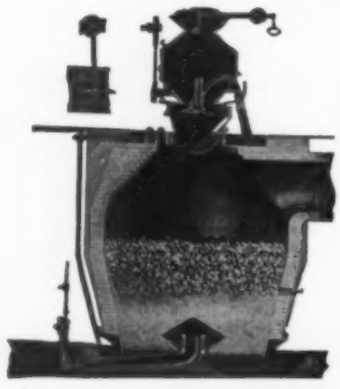

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The Standard in Both
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MORGAN CONSTRUCTION CO.
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for electrochemical plants are specially designed to meet the demands of this service.

The Westinghouse Electric and Manufacturing Company has made an exhaustive study of plant conditions both in this country and abroad. The experience thus acquired has enabled us to build transformers that will give the user thoroughly successful continuous service.

Some of the special features of Westinghouse transformers are—

High Efficiency,

Insulation that will stand up under the most severe service,

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Seamless Brass Cooling Coils.

Proper selection is as important as proper design in transformers. We are in a position to serve you to the fullest extent in making the proper selection. Let us know your requirements.

Westinghouse Electric & Mfg. Company

East Pittsburgh, Pa. **Sales Offices in 45 American Cities**

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Acheson - Graphite Electrodes are made in the form of rods, tubes and plates for Electrolytic, Electrothermic and Electrical Purposes. They are easily machined, threaded and cut, and thus permit good mechanical arrangement.

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We make many grades of powdered graphite. As a filler for Dry Cells, for Paint Pigment, for Stove Polish, for Pencils, for Electrotypers' leads, for Boiler Use and all other purposes where Graphite is used, Acheson-Graphite is unequalled. Its uniformity and high purity command respect and win pronounced appreciation as compared with mined graphite.

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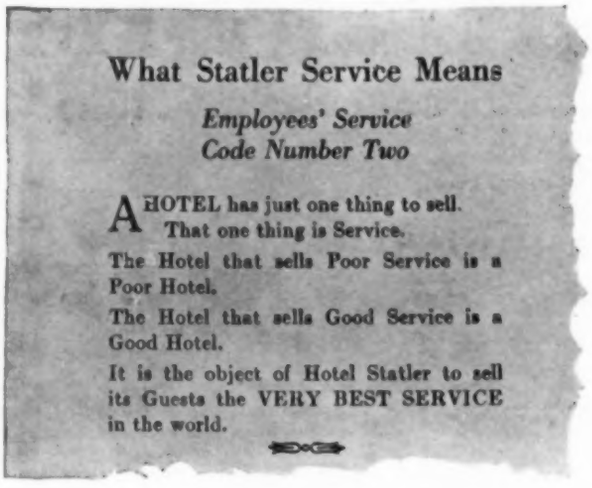
ACHESON TRADE ELECTRIC FURNACE MARK GRAPHITE

THE PUBLISHER'S PAGE



What Statler Service Means

Employees' Service
Code Number Two

A HOTEL has just one thing to sell.
That one thing is Service.

The Hotel that sells Poor Service is a Poor Hotel.

The Hotel that sells Good Service is a Good Hotel.

It is the object of Hotel Statler to sell its Guests the VERY BEST SERVICE in the world.

Service

The clipping reproduced above is from a booklet issued by the Hotel Statler of Cleveland.

It suggests an analogy which may be expressed by paraphrasing the extract:—

A technical magazine has just one thing to sell.

That one thing is Service.

The magazine that sells Poor Service is a Poor Magazine.

The magazine that sells Good Service is a Good Magazine.

It is the object of Metallurgical and Chemical Engineering to sell its customers the VERY BEST SERVICE in the world.

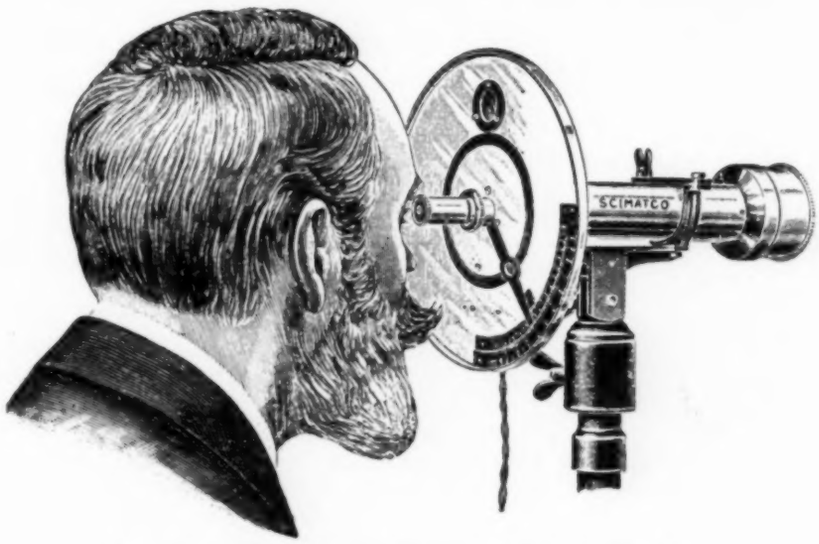
Two kinds of service are rendered by Metallurgical and Chemical Engineering to its readers.

First comes the service rendered by the editorial staff in providing text pages of interest and value.

Secondly comes the service rendered by the business staff in providing advertising pages of interest and value.

Both kinds of service are necessary to the reader. Both of them are what he pays for.

A reader who buys a technical paper and reads only the text pages and not the advertising pages, or only the advertising pages and not the text pages is like a hotel guest who pays for a room and bath and uses only the bed or only the tub.



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Does the heat treatment of your molten metal, while still in the furnace, effect its physical properties?

What effect does the pouring temperature have?

Is there a waste of fuel in heating furnaces higher than necessary?

Is the life of your refractory material a matter of days or degrees of heat to which it is subjected?

Has the quality of the finished article any relation to rolling or forging temperature?

If you are interested in any of the above problems then you should have our catalogue on the new **Scimatco Optical Pyrometer.**

The most accurate instrument for taking high temperatures inside or outside of the furnace. The ideal pyrometer for measuring temperatures of materials in their molten state.

The Laboratory Apparatus Blue Book free to any Laboratory
(537 pages)

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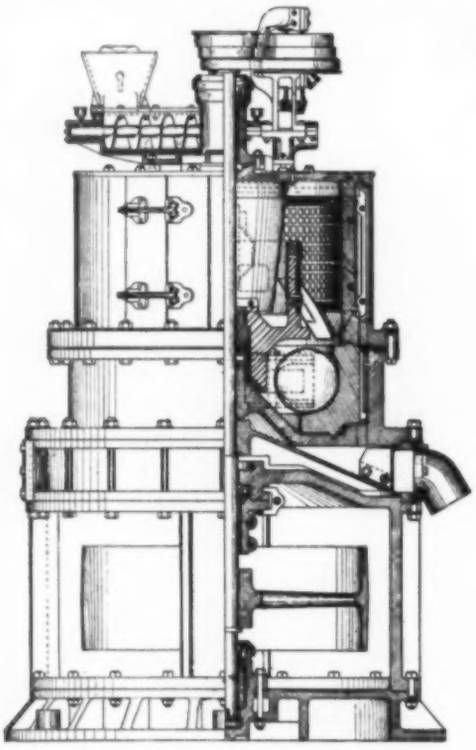

How Much Will It Cost to Pulverize Coal?

Coal is most economically pulverized by

The FULLER-LEHIGH PULVERIZER MILL

BECAUSE

The equipment is simple.
The equipment is substantial.
The equipment is dependable.
The cost of foundations is lowest.
The cost of structure is lowest.
The cost of installation is lowest.
The power cost per ton of coal is lowest.
The lubricating cost per ton of coal is lowest.
The operating cost per ton of coal is lowest.
The maintenance cost per ton of coal is lowest.

Fuller Mills pulverize 25,000 tons of coal per day for heating various types of industrial furnaces.

Full Information and Catalogue upon Request.

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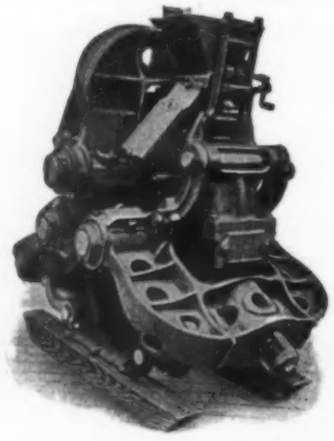

Most Economical Grinding

FROM RESULTS OBTAINED BY OUR CUSTOMERS WE ESTIMATE THE CAPACITY, AS FOLLOWS, OF THE

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Limestone	4 tons per hour to	95%	100 mesh
Florida Pebble	7 tons per hour to	90%	60 mesh
Bauxite	4 tons per hour to	95%	100 mesh
Hardest Ores	5 tons per hour to	90%	50 mesh
Coal	4 tons per hour to	95%	100 mesh
Silica	2 tons per hour to	95%	200 mesh
Cement Clinker	10-12 bbls. per hour to	98%	100 mesh

WITH UNDER 25 H. P. MINIMUM WEAR AND REPAIRS

Used as a Standard Grinder by the United States Steel Corporation, Aluminum Company of America, Pennsylvania Salt Manufacturing Company, Virginia Carolina Chemical Company and practically universally in the chemical fertilizer factories of the United States and Europe.

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TRADE — CRUSHING PULVERIZING & SHREDDING — MARK — MACHINERY

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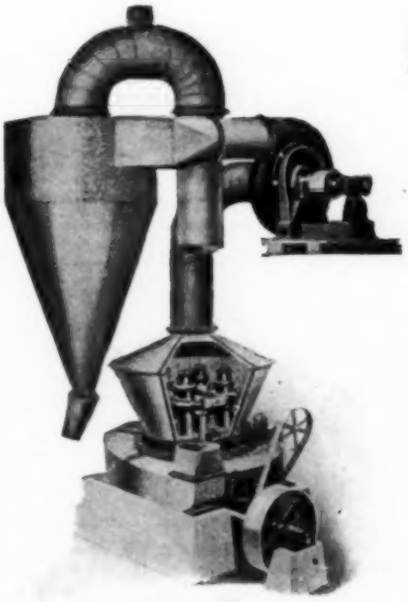
Burn Pulverized Coal Instead of Crude Oil or Gas and Save 2/3 the Cost

Every day we receive letters from officials of large corporations and engineers in the steel and iron industries inquiring about the adoption of powdered coal which is now replacing crude oil in plants where we have made installations of the

RAYMOND COAL PULVERIZERS

The price of crude oil is prohibitive, besides the supply is limited. So also is the supply of natural gas and a producer gas plant is very expensive to install and maintain.
The price of low grade coal is cheap and the supply is inexhaustible. When ground fine enough the heating efficiency of coal is equal to any fuel and the cost less than 1/3 that of oil. A Pulverizing plant can be installed for 1/3 the price of a Producer Gas Plant.
The fine grinding of the coal is the chief problem. This we have solved for you in the



RAYMOND PULVERIZING-AIR SEPARATING SYSTEM

the only coal grinder which will pulverize to the fineness necessary for best results. The Raymond System has for years been recognized as the standard for pulverizing coal in cement manufacture. This system discharges the coal at the lowest possible temperature, hence it can be stored in bins for much longer periods of time without fear of spontaneous combustion.

Raymond Record of Economy in One Plant

Is saving 12% in coal—due to the greater fineness.
Is grinding 6 times as much as the mill it replaced.
Is saving ½ cost of power for grinding.
Is saving 66 2/3% in labor expense.
Is keeping the grinding room free from dust.
Raymond Mills have ground coal at a cost of 12½c. a ton exclusive of power, saving $2,743.00 in one year on 13,000 tons.

Separating the ground coal by air elminates all bolters, reels and screens, which are costly to install and to maintain. No product is wasted, no tailings to be reground.
Manufacturers who have grinding problems in other industries will find that the Raymond Mill, while most efficient in producing a ground product of any required mesh, will at the same time work economies of so many and varied kinds that they will prefer it to all others.
Raymond Mills simply grind and separate the coal and have no connection with methods or systems of combustion. That is a field which we leave to those who specialize in it.
All installations guaranteed to do what we claim.

Get our Book and learn of the high efficiency of this better method of grinding. It may save you tens of thousands of dollars on a comparatively small investment.

We design special machinery and methods for Pulverizing, Grinding, Separating and Conveying all powdered products. We manufacture Automatic Pulverizers, Roller Mills, Vacuum Air Separators, Crushers, Special Exhaust Fans and Dust Collectors.

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Please send me your book on Modern Methods of Pulverization and Air Separation.

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A Mill for Either Wet or Dry Grinding

Moderate in Price, it meets the needs of those requiring small, yet strong and substantial Mills

SATISFACTORY PATTERSON MACHINERY

The Sign of the Best that Money Can Buy

This is the Patterson type "E" Grinding Cylinder. It is constructed with heavy cast iron housings, cast iron heads and Steel barrel.

A Patent gasket is used to make water-tight joints at all points of contact; and the lining, which is of porcelain, is tongue and groove, laid in the best Portland cement; and the lining in the door is one solid piece of porcelain. A charge of imported French Grinding Pebbles is furnished with each mill.

Sizes 12" x 18", 18" x 25", 24" x 36", 30" x 42", 36" x 48", 48" x 60".

Horse Power, 1, 1½, 2, 3, 4, 6. Add 30% for starting.

Floor Space, 2' 0" x 3' 4", 2' 0" x 4' 0", 2' 6" x 5' 0", 2' 0" x 7' 6", 3' 6" x 8' 6", 4' 6" x 9' 6".

Catalog and prices on request. Write.

The Patterson Foundry & Machine Company

East Liverpool, Ohio

Cat. G2 will interest

Scientific Sharps

can figure out for you the necessary metal needed under certain conditions to withstand certain strains, but there is always needed a

Safety Factor

when sizing up a Traylor gyratory. Keep this in mind and note the splendid distribution of metal to withstand the strains. Note also the high carbon steel driving gears. Look into the fact of how we are able to compensate for the wear on same.

Note how easy of removal they are, due to their being keyed, not riveted.

The countershaft being removable does away with the undesirable necessity of babbitting in place.

Let us explain our system of eccentric lubrication.

We also build a full line of stamp milling, concentrating, cyaniding and smelting machinery

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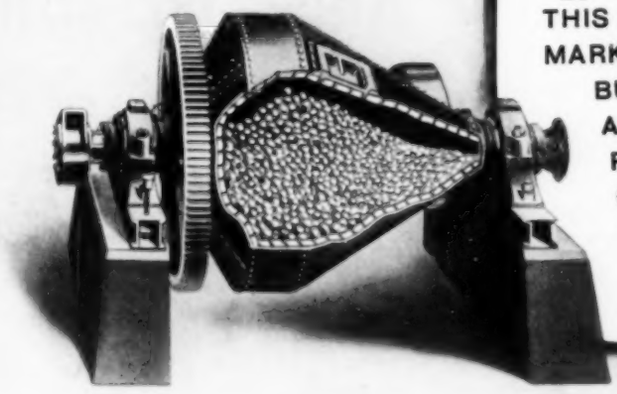

IN THE INDUSTRIAL FIELD
THE SCOPE OF THE
HARDINGE MILL
IS ALMOST UNLIMITED

IN ANY INDUSTRY WHEREVER FINE GRINDING IS REQUIRED THIS MACHINE WILL SHOW REMARKABLE EFFICIENCY. IT IS BUILT IN MANY SIZES, EACH ADAPTED TO A PARTICULAR RANGE OF CRUSHING, AND CAN BE OPERATED EITHER WITH OR WITHOUT WATER.

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It doesn't strike—IT CRUSHES

Finer pulverizing with less power is accomplished with the *American Ring Pulverizer*. A rotary hammer mill requires twice as much speed—and even then the results are not so good.

The *RING* in the American Ring Pulverizer solves the problem that inventors have struggled with for many years. *Centrifugal force* is gained in combination with *Kinetic energy*.

The AMERICAN Ring Pulverizer

The greater portion of the reduction of speed is due to the utilization of centrifugal force thru the RING, because its centrifugal force is not only nearly twice as great as its Kinetic energy at a given speed, but it serves as a *crushing force* and not as a striking blow.

All the crushing and grinding parts are made of best Manganese Steel.

These machines will crush and pulverize rock, coke, coal, ore, cement, clinkers, barytes, carbon, slag, etc.

Made in several sizes.

Write for latest catalog and list of users.

American Pulverizer Co.
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No. 2 Jar Mill

Yes, Special Design Always Pays

BUT there is no economy in paying for special design in a Jar Mill when one of the Abbé standard types would meet your requirements. Then, investigate

Paul O. Abbé Jar Mills

and you may cut costs otherwise deemed irreducible. At the same time, if you **need** Special Design, no one is better qualified than myself to lend co-operation.

My 18 years experience covers very thoroughly the field of Crushing, Mixing, Sifting and Grinding Machinery. Look for my trademark. Send for my Bulletin.

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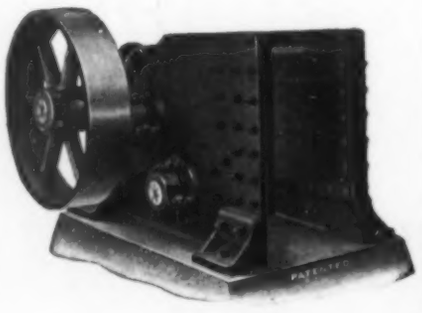

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CRUSHERS **GRINDERS** **SCREENS**

Thirty Years of Practical Experience has taught us that no one machine is adapted to all purposes. Customers expect correctly designed machines for their special work. Our large line enables one to select properly. It consists of:

CRUSHERS — For coarse, medium and fine work on hard or soft rock. Jaw, Rotary and Hammer design.

CRUSHING ROLLS — Coarse, medium and fine. Hard or soft rock,— wet or dry.

TRI-ROLL MILLS — For medium crushing, giving Two Roll Reductions.

RING-ROLL MILLS — For pulverizing hard materials.

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SCREENS — Inclined Vibrating and Rotary for fine or coarse work — wet or dry.

Sampling Crushers, Rolls, Grinders and Screens. **Send for Catalogue.**

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TUBE MILLS RESISTANCE WIRE
FORGINGS OF ALL QUALITIES OF STEEL
SPECIAL MACHINERY OF ALL CLASSES

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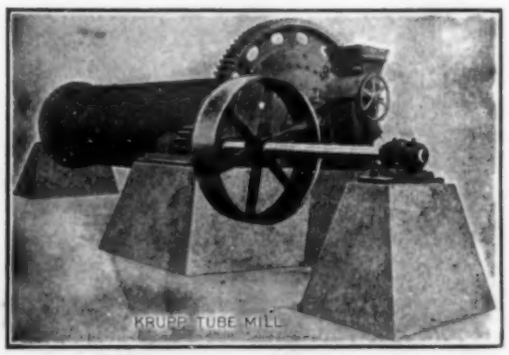
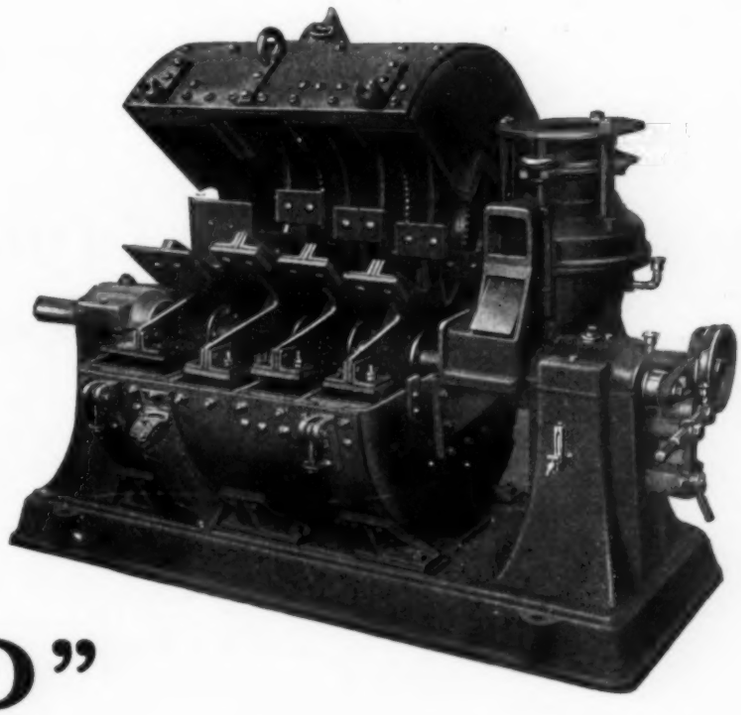


From Coal to Impalpable Dust



The "AERO" Pulverizer

involves a new principle in coal pulverization, in that its grinding is done in successive stages.

The machines are either three or four chamber, depending on their type, the operation of all machines being as follows. The coal is introduced into the hopper at one end of the machine and enters chamber one, where the revolving spider engages it in opposition to an axial air current. When it is ground to the limit of that chamber's duty, it is then forced into chamber two, which is of greater diameter. Here, the grinding is carried still further, since the fineness is proportional to the square of the peripheral speed. This operation is continued in each successive chamber: and after being ground in the final compartment, it is an impalpable and almost molecular dust. It is there mixed with fresh air introduced through an adjustable damper, and is then ready to be completely oxidized by combustion in the furnace.

The parts of the pulverizer subject to wear are accessible and adjustable—the bearings generous in size and self oiling.

Made in four standard sizes, or special, to conform with your needs. Write us for literature, and learn all about it.

The Aero Pulverizer Company

71 Broadway, New York

A PROOF NOT AN ARGUMENT

On the PANAMA CANAL - - - 80%
On the CATSKILL AQUEDUCT - 75%
On the NEW YORK STATE BARGE CANAL - - - 50%
of all the ROCK CRUSHING is being done with

McCully Gyratory Crushers

Could ANYTHING be MORE CONVINCING of Their MERITS?

Of course, these are exceptionally large jobs.

That is just why we mention them. There are a great many different contractors involved and it is evident how many of them agree as to which is THE crusher. Moreover, it is for such large jobs that the greatest care is taken to select the BEST crusher. Only the best is good enough.

On small jobs this is not so important. But—we could go on and give a long list of smaller jobs where our crushers are the ONLY ones used.

If you want to know WHY the McCully Crusher is preferred to all others, send for our bulletin PM4-71

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WORKS: CUDAHY, WIS. New York Office: 115 Broadway

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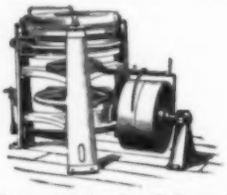
GRINDING MILLS



Improved Lead and Paste Mill

Disintegrators, Dryers
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LABORATORY AND FACTORY

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SPECIAL MACHINERY

Promptly Furnished

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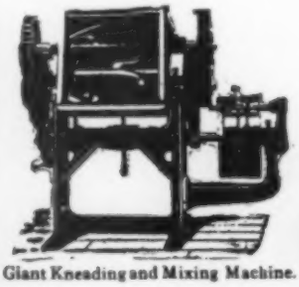

Giant Kneading and Mixing Machine.

Write for Catalog showing complete line of Mills and

MIXING MACHINES

D

What the User Says — No. 1

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Broughton Mixers for Fire Clay

RUTLAND, Vt.

DEAR SIR:—In regard to the Mixer purchased from you, would advise that we have been using the same continually for the past year with very satisfactory results and as far as we are able to tell at the present writing, there is no appreciable wear.

We are mixing some materials that require very thorough work as the amount of one of the ingredients is 1½ pounds to the ton. You can readily see from the above statement that if the Mixer did not do thorough work it would be impossible to intimately mix a small quantity with a ton of other materials.

Wishing you success, we remain,

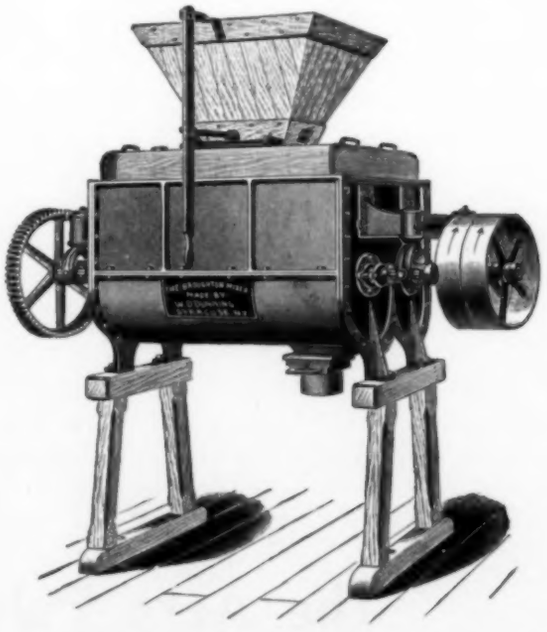
Yours very truly,
RUTLAND FIRE CLAY CO.,
A. W. PERKINS.

Whatever Your Mixing Needs

there is a Broughton Mixer that will do the work more speedily and cheaply than any other device. Fire Clay, Soap Powder, Salt, Sand, Gun Powder, Lime, all Chemicals can be handled by Broughton Mixers.

Get our price and data on Standard or Special Designs.

Send for newest Catalog.



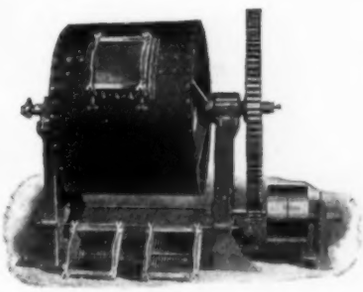
W. D. DUNNING, Syracuse, N. Y.

D

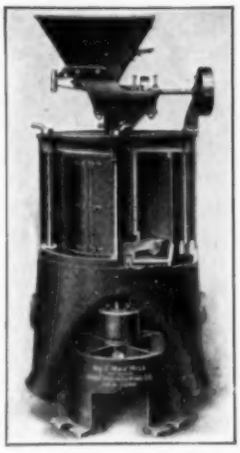
Mills that Stand the Grind

TUBE MILLS, PEBBLE MILLS, BALL MILLS, DISINTEGRATORS, CUTTERS AND SPECIAL MACHINERY

For Grinding All Materials



No. 3 Abbé Pebble Mill. Built in 25 Sizes Having Charging Capacities up to 4000 lbs.



Improved "Max" Mill (Patented) for Grinding Nitre Cake, Arsenate of Lead, Salts, Lime, Sugar, Etc.

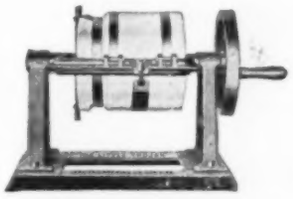
25 STYLES **59 SIZES**

Just what you want, when you want it from our stock of 100 machines. Remember, too, that we make

High Vacuum Pumps, Vacuum Heating Pumps, Pressure Blowers and Bolting Cloth.

If you have any of these on your mind, Write, Phone or Wire.

Make use of our 34 years' experience and testing laboratory when you have Grinding Problems to solve.



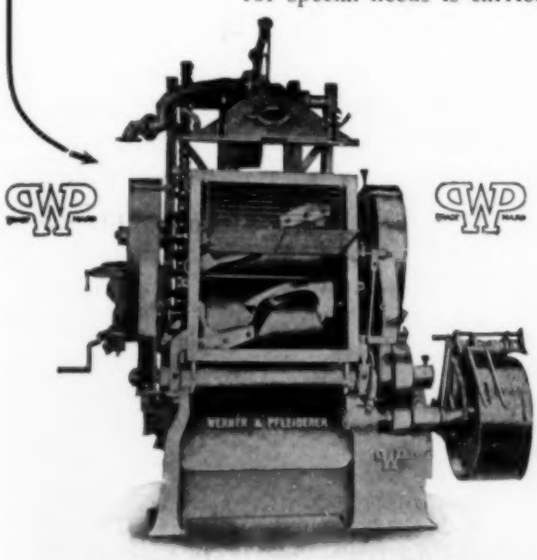
Abbé Laboratory Porcelain Jar Mills. Built in Sizes to Meet Almost Any Capacity. IMPORTED JARS.

ABBE Engineering Co.

218-220 Broadway 'Phones, Cortlandt 55 and 56 **New York**

These Blades Are Designed to Knead the Toughest, the Most Tenacious Materials

so that the moisture, solvent, etc., can be extracted at low temperature. Observe them carefully and you will notice their peculiar design. They are an example of how special design for special needs is carried through



Machine Tilted for Emptying; Vacuum Cover Raised

UNIVERSAL

Kneading and Mixing Machines

Not only the blades, but the mixing troughs are specially planned for the purpose in view. Furthermore, Universal machines are the *only* machines in which kneading and mixing are successfully combined.

Very surely you have some problem along these lines that up to date may have defied mechanical handling. If so—let us lend our co-operation and *solve* it. We have done this for others.

Write

Werner & Pfleiderer Co.

Saginaw, Mich.

EUROPEAN HOUSES

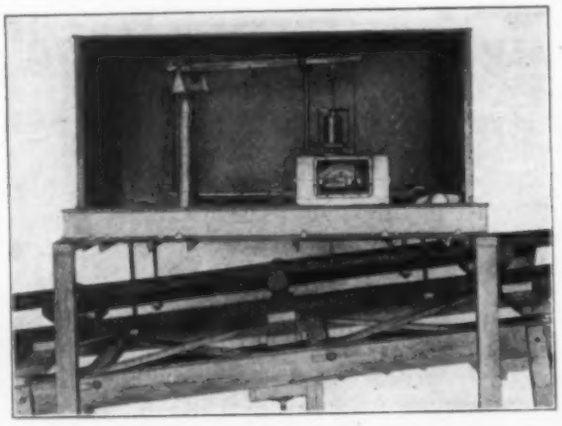
CANNSTATT-STUTTGART, PARIS, MOSCOW, MILAN, ZURICH, HAGUE, LONDON, BERLIN, HAMBURG, COLOGNE, FRANKFORT, VIENNA, DRESDEN, PETERBOROUGH

The Number of Repairs Made by Us in 7 Years to Morse "Rarefied" Collectors is Here →

Put it just before the fan and that's all there is to it. No moving parts or delicate adjustments.

Of course they do need repairing at times but it amounts to a simple bench job for the average handy man.
These collectors are working and have been working in the following plants for the past few years:
The Burgess Sulphite Fibre Co., Berlin, N. H.
The Montezuma Copper Co., Mexico.
The Croton Magnetic Iron Mine, Brewster, N. Y.
The Penn. Salt Mfg. Co., Wyandotte, Mich., and others.
They will sidetrack and eject all suspended material, heavier than air, such as finely divided metal, emery, sand and tumble dust.
It saves the fan.
It saves cleaning the fan, and it cleans itself.
Get the catalog, sizes and prices.

The Knickerbocker Company, Jackson, Mich.



The Merrick Conveying Weigher

will give you an Accurate Record of Weight in any unit desired

Are you using belt, bucket or pan conveyors? Are the loadings intermittent? Continuous? Is the operation at partial or full capacity?
It makes no difference—the Merrick Conveying Weigher will give you a record of weight with a guaranteed accuracy.

Within One Per Cent

So simple is it, that the ordinary "hand" can operate it. Readings can be duplicated at distant points. This device is endorsed by highest authorities.

The Conveying Weigher Co.
90 West Street, New York City

A Big Company May Be Misjudged

by the buying public if it is a small advertiser. How many of your customers have seen your factory or know anything of your facilities beyond what they have learned from your advertising? Make your advertising, therefore, thoroughly representative of your business.

You can't expect strangers to recognize you as a leader if all they know about you looks small and unimportant.

Cement Mixing and Weighing

The cement machines used for mixing the limestone and other materials are set up tandem fashion. The crude materials are first crushed to pieces, averaging the size of a walnut, and fed into hoppers leading to the respective weighing machines. In one of the receptacles of the tandem machine must be deposited, say 200 pounds of limestone, and in the other receptacle eighty pounds of clay or shale stone.

These materials fall from the hopper on a metal slatted conveyer, the speed of which is automatically controlled by the weighing receptacle. To illustrate: When 190 pounds of the limestone has been deposited in the limestone receptacle and seventy-five pounds of shale in its respective receptacle, a trip lever reduces the speed of both conveyers proportionately, and the final quantities making up the total weights drop into the receptacles slowly until the exact weight is obtained. By another lever device, which operates only when both receptacles contain their due quantities, the two receptacles are dumped simultaneously, the materials being carried off and mixed together for roasting or passing into the grinding mill to be ground into cement.

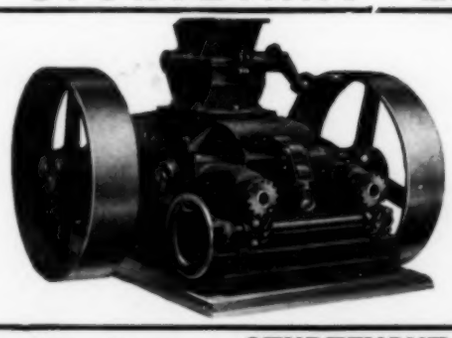
This is the way
Automatic Machines
are cutting cost production

in hundreds of plants. Take their principle of AUTOMATICALLY Weighing, Proportioning and Packing raw or manufactured products—and apply it *to your* plant. You will save on salaries, you will get your processes absolutely correct, you will save floor space, eliminate under and over-weights. Many chemical and industrial plants find Automatic Machines indispensable. It *pays* to be in this class—and our experts are prepared to demonstrate to your satisfaction. Write.

Automatic Weighing Machine Company
134-140 Commerce Street
Newark, N. J., U. S. A.

Automatic Clinker and Gypsum Scale

STURTEVANT LABORATORY MACHINERY



¶ **Absolute accessibility—instant cleaning. Quick and accurate adjustments—heavy substantial designs, large outputs. The best that can be made.**

CRUSHER Size 2″x 6″—Wt. 700 lbs. Power 1 h. p. Output 300 to 600 lbs. Fineness ½″ to ¼″. Built also in 10 larger sizes.

ROLLS 8″x 5″—Wt. 650 lbs. Power 1 h. p. Output 200 to 1200 lbs. per hour. Fineness ½″ to 60 mesh. Built also in larger sizes.

GRINDER 8″ discs—Wt. 200 lbs. Power 3 h. p. Fineness 20 to 100 mesh. Output 10 to 100 lbs. per hour.

SCREEN Size 12″x 24″—Wt. 125 lbs. Power ¼ h. p. Capacity 50 to 1000 lbs. per hour. Send for Catalog 67.

We make a complete line of Crushing, Grinding and Screening Machinery.

New York Cleveland Chicago Pittsburgh **STURTEVANT MILL CO., BOSTON, MASS.** Atlanta Denver Victoria, B. C. London, England

Single Unit I. O. C. Generator

It is no extravagant statement
to say that the OXYGEN produced by the

I.O.C. SYSTEM

is of the *highest purity*, and insures the *best* results when used for cutting and welding

BOOKLET Illustrating Recent Installations—*on request.*

INTERNATIONAL OXYGEN CO., Waverly, Newark, N. J.
115 Broadway, New York PITTSBURG, PA., Park Bldg. PARIS, FRANCE—40 Rue Laffitte.

An installation like this assures a DEPENDABLE supply of pure OXYGEN, CHEAPER by HALF than cylinder gas

The BURDETT System

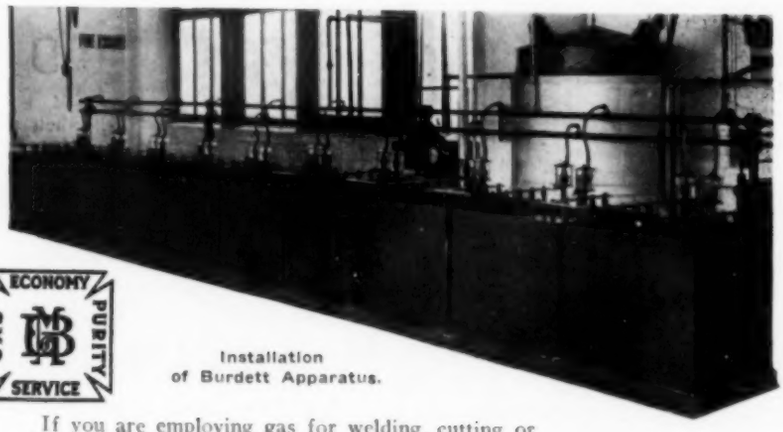
Looking at it from the dollars-and-cents standpoint alone, a saving of about 50% in your cost of gas for cutting and welding would, in a year, amount to a handsome figure.

Almost invariably the Burdett installation is paid for in that time by the saving it effects.

But there are other factors to be considered which are of equal import.

Behind the Burdett organization are men who have been identified with this industry since its inception in America—men who by reason of long experience are enabled to follow out a broad plan of service, not only in supplying economical apparatus exactly suited to conditions but also service on anything along the lines of cutting and welding.

This service is at your disposal.



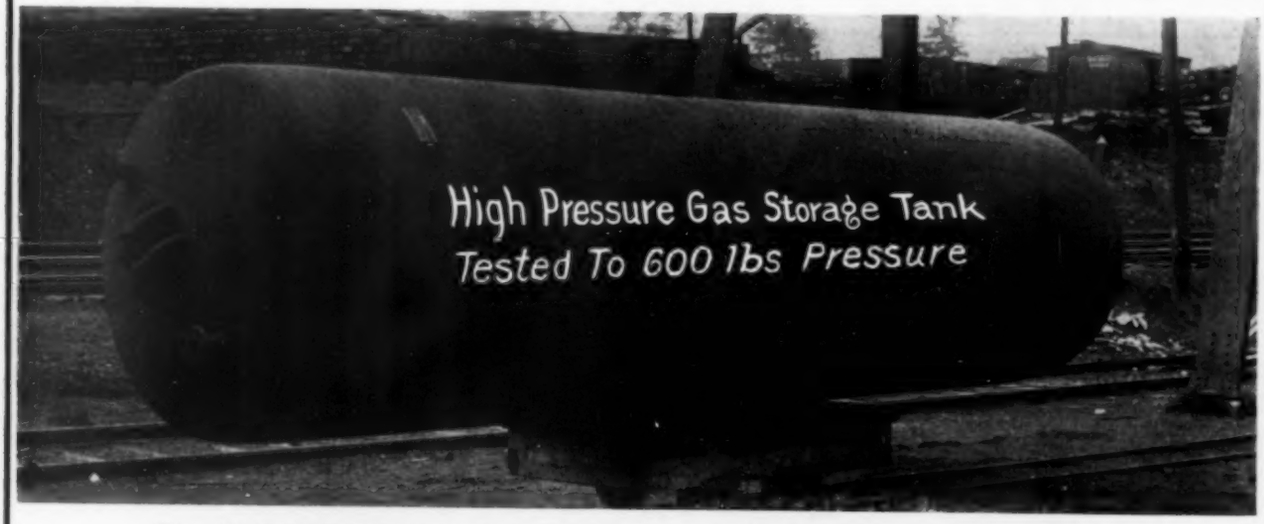
Installation of Burdett Apparatus.

If you are employing gas for welding, cutting or chemical uses write us for Bulletin No. 6. Through it you will be enabled to get facts, figures, costs and full data on a generating plant *exactly* suited to your individual requirements and delivering gas at an *irreducible minimum* cost per cubic foot for an *uninterrupted* supply of *chemically pure* gas.

Just ask for Bulletin No. 6.

The Burdett Mfg. Co.

1401-05 Jackson Blvd., Chicago, Ill. **50 Church St., New York**



LAP-WELDED PRODUCTS

AND SPECIALTIES

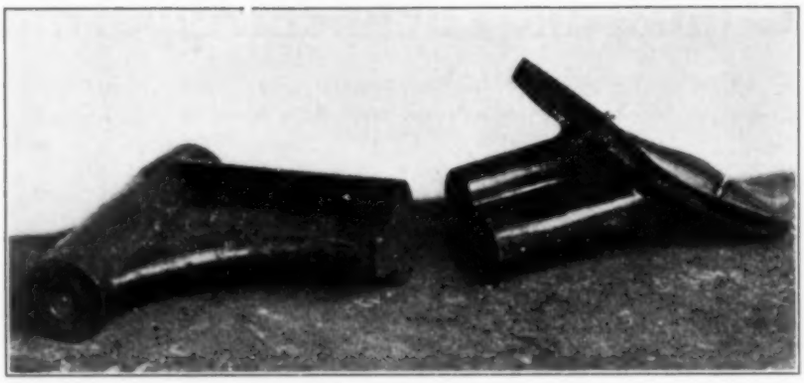
Seamless Steel Pressure Tanks, Digesters, Boiling Kettles, Ammonia Receivers, Acid Tanks, Retorts, Stills, Lead Melting Pots, Jacketed Kettles, Varnish Kettles, Etc. **Special CO_2 Tanks for Brewery Use.**

American Welding Co., Carbondale, Pa.

WRITE FOR BULLETIN

A Cast Iron Arm

Approximately 6″ x 7″



BEFORE
Broken

AFTER!
Welded

Time, 15 Minutes—Cost, 22 Cents

based on 30 cents per hour for labor, 2 cents per K. W. hour for current. Cost includes current, labor, and material used.

Such Work is done with our Drooping Characteristic Machine

with which no resistance is used. This is the ideal machine for rolling mills, steel foundries, and general heavy work.

If you are interested in welding tanks, boilers, etc., ask for details on our Constant Voltage Welder, the "INVINCIBLE." Write!

Welding Materials Co.

Main Office, 149 Broadway **New York**

Philadelphia, Rumsey Electric Co.
Buffalo, Buffalo Electric Co.
Boston, Wetmore-Savage Co.
Los Angeles, Electric Sales Co.
Brazil, Carr & Tyler Co.
Seattle, Wash., W. Montelius Price.
Pittsburgh, Crescent Elec. Mfg. Co.
Baltimore, Richard Morton.
San Francisco, Hicks & Marks.
Cleveland, 38th and Kelley Ave.
Atlanta, Bird-Wilcox Co.
Japan, Okura & Co.

Brains alone **can do nothing**

The most perfect methods fail with imperfect apparatus.

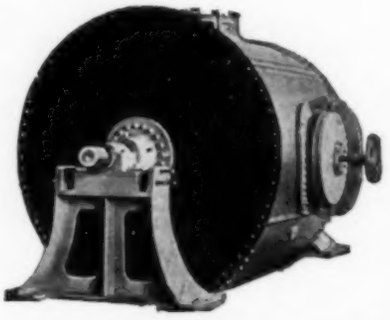
You furnish the brains and let us furnish the

Perfect Metallurgical and Chemical Apparatus

We build the highest grade apparatus made of steel plate, sheet iron, cast iron, copper, block tin or lead of our own designs or to your specifications.

Tanks of All Kinds

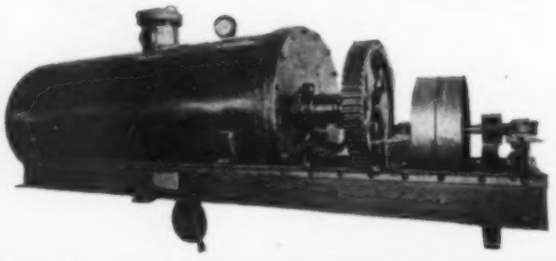
Vacuum, Air, Steam Jacket, Lead Lined Boilers. Our estimate should be secured the first thing when you contemplate ordering lacquer apparatus, paint cars, mixers, tubs or lead mixers.



L. O. KOVEN & BROTHER
50 Cliff Street NEW YORK
Works: JERSEY CITY. Cable Address: "KOVENLO"

The most efficient Rotary Vacuum Dryer so far

This STOKES Improved Rotary Vacuum Dryer can be used for drying in bulk wet mass material, such as press cakes, saltpeter, white lead or similar materials, which must be dried at a moderate temperature. The construction is very rigid. All seams and joints in the vacuum chamber are welded and steam leaks are impossible. A special type of agitator has been designed which reduces the power required one half, and which empties the chamber completely discharging through one central outlet.



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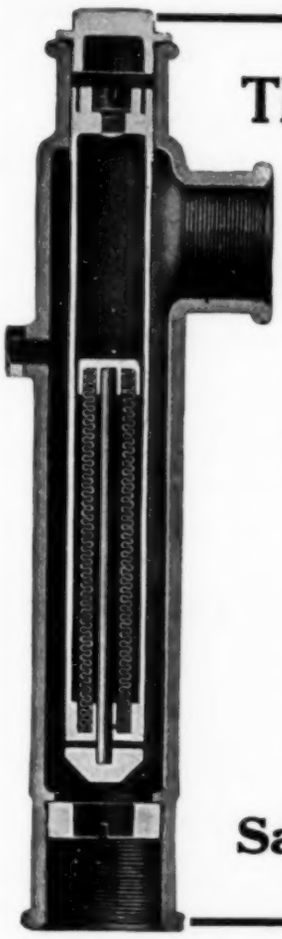
F. J. STOKES MACHINE CO.
PHILADELPHIA, PA.

Oxygen and Hydrogen made practicable by the

It is an autogenous Gas and Pressure Generator
It furnishes automatically the desired Working Pressure
It brings to their full value Oxone and Hydrone

AUTOGENOR

For Further Particulars address:
The Roessler & Hasslacher Chemical Co., New York



The Simplest, Most Compact Steam Trap On The Market Is The

"SARCO"

It is designed for use with both high and low pressure, and is guaranteed to give entire satisfaction under either condition of service.

The valve is opened and closed by the contraction and expansion of a fluid extremely sensitive to fluctuation in temperature. This fluid is contained in a hermetically-sealed tube, the whole being enclosed in a casing which can be screwed into the steam line like any fitting.

The "Sarco" Trap works continuously, with a pulsating action, and thus requires

No Useless Storage Capacity

such as increases the bulk and cost of other traps. There can be no loss of steam, as the steam always finds the trap closed. All condensation is ejected as fast as it forms, and pipes are kept clear.

We also manufacture: "Sarco" Water Temperature Regulators, "Sarco" Smoke Recorders and "Sarco" Automatic Combustion Recorders.

Ask for descriptive bulletins.

Sarco Engineering Co., 116 Broad St., New York

Chicago: Room 1785 Old Colony Building

We have made LEAD LINED IRON PIPE over Twenty Years

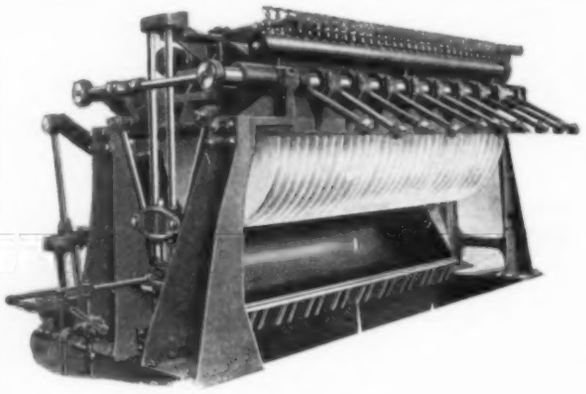
Be sure that you use "Amalgamated" Lead Lined Iron Pipe—We are the only makers of that pipe in the United States.

Also Lead Lined Iron **Valves**
Lead Lined Iron **Stop Cocks**
AND
Tin Lined Iron Pipe

Lead Lined Iron Valve

MANUFACTURED BY

LEAD LINED IRON PIPE CO. Wakefield, Mass.



"Dumps Like A Steam Shovel!"

The cake is dumped instantly and cleanly from the

"Sweetland"
Self-Dumping Filter
(Clam Shell Type)

The illustration shows the hydraulically operated type. It is opened and closed automatically. Several giant filters of this type may be attended by one man. Our "Method A" of "direct contact" washing is the most satisfactory washing system yet devised. Sweetland Filters are an unqualified success, as is attested by many repeat orders. Remember we are headquarters for

LEAD LINED FILTERS FOR ACID SOLUTIONS

Send for new Catalog No. 10

The Sweetland Filter Press Company
926 Singer Building NEW YORK

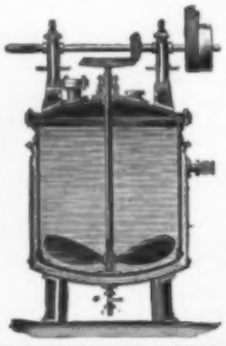
For Laboratory Use

Karl Kiefer Filter Press
Using Filter Paper

Something new in a press for filtering small quantities.
At least a 40% saving in filter paper.
Absolutely airtight, therefore no loss due to evaporation, as is the case with funnels when filtering articles such as extracts, perfumes, etc. Write for particulars.

THE KARL KIEFER MACHINE COMPANY
Manufacturers of Filter Paper
921 Martin Street - Cincinnati, U. S. A.

When we make lead-lined or lead-nickel-lined copper and iron vessels



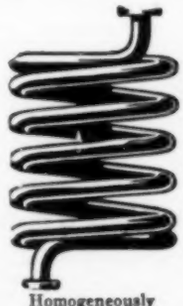
the outer and inner metals are inseparable

and extreme heat or acids will *not* affect them.

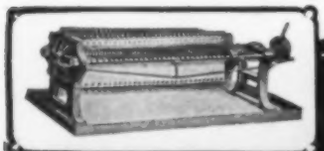
We make homogeneously lead-coated copper tube coils and vessels of all shapes to *permanently* withstand every working pressure. The thin metal walls insure a greater heating effect, and rapid action; the inherent stability prevents sinking down on bottom of vessel, or distortion of the lining; water locks are obviated.

Get our printed matter explaining our method and showing some of the lines apparatus we have made. Tell us *your* requirements.

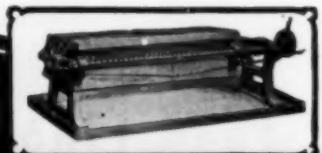
AKTIENGESELLSCHAFT
KÜHNLE, KOPP & KAUSCH, FRANKENTHAL, PFALZ
Representative in the U. S. of America
Bartholomew Viola, M.E. Consulting Engineer 140 LIBERTY STREET NEW YORK



Homogeneously Lead-Coated Inside, Outside, or Both.



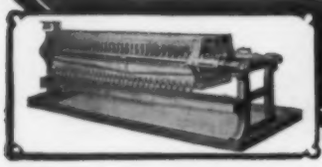
SPERRY

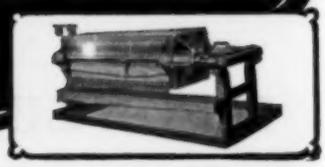


FILTER PRESSES

Superior in economy of operation and mechanical construction

Sperry Laboratory Presses save time and labor, and are most complete





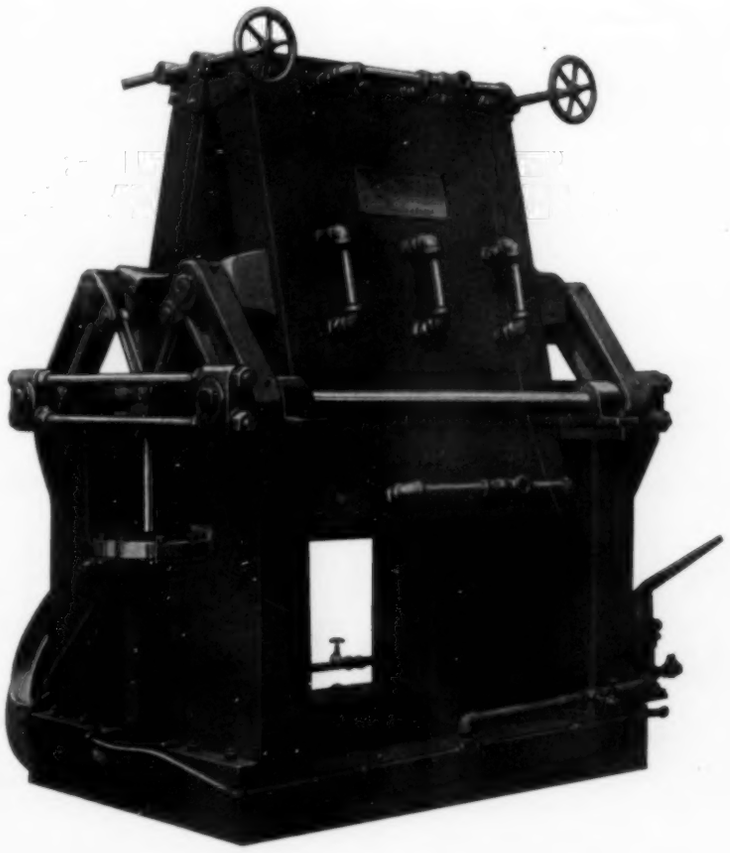
D. R. SPERRY & CO., Batavia, Ill.

When We Make The Statement That The Worthington Filtering Processes

Berrigan Patents

by their precision, automatic retention of pressure, efficiency and economy, are the ideals for clarifying, filtering and condensing we are in a position to fully substantiate it.

Twenty-four U. S. and Foreign Patents Granted



Other Patents Pending

The actual power required to place in operation, to run from 5 seconds to 48 hours, is ten seconds (with steam) or three minutes (by hand).

The length of time required to filter any given amount is absolutely controlled by a drop of water.

Presses built with from one to 50 pressing units. If desired, can be run continuously on solids.

Sold on the basis of work-actually-accomplished. You can make your own tests at our plant. Write.

HENRY R. WORTHINGTON, Hydraulic Works, HARRISON, N. J.

EMIL E. LUNGWITZ, 80 Maiden Lane, NEW YORK, N. Y.

Sole Eastern Rights

The Kelly Filter Press

PATENTED

The Kelly Filter Press Co., Salt Lake City, Utah

KELLY FILTER PRESSES have been used for so many years, and have been continuously and successfully treating so many different classes of material, that you can not fail to obtain entire satisfaction if you install the Kelly Filter Press. Explain your filtration difficulties to us, and allow us to make suggestions based upon our long experience as filtration specialists.

You Need Not Experiment We Have Done That For You

Our engineers, with experience in all industries where evaporators are used, have solved the problems so well that to-day the **SWENSON is standard.** The stage of experiment has passed —**that of results is here**—results obtained by the use of

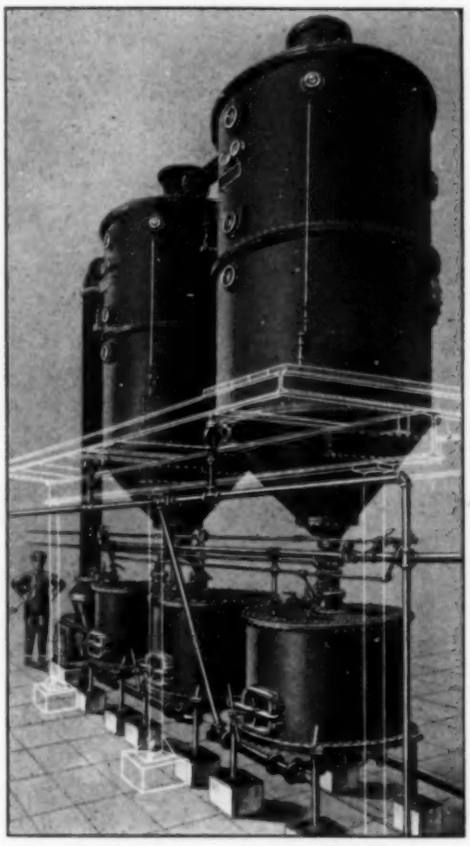
SWENSON EVAPORATORS

EVERY OTHER ONE we sell is delivered to a man who CAME BACK FOR MORE. There is no secret about it—it is just real engineering ability applied to each separate case, coupled with the best of materials and workmanship—*that's all.*

SWENSON EVAPORATOR CO.

945 Monadnock Block **CHICAGO**

(49-26)



Double Effect for Electrolytic Caustic

The Mantius Crystallizing EVAPORATOR

For the economical concentration of CRYSTALLIZING SOLUTIONS

Salts are removed in a thoroughly washed condition without interrupting the work of the evaporator.

No centrifugals necessary, greatly reducing first cost and saving much labor.

No loss of liquor by entrainment.

200 tons of salt are handled daily by evaporators of this type.

For all solutions that tend to encrust the heating surface this style of construction should be used because of the vigorous circulation that continually scours the interior of the tubes, and the readiness with which these tubes can be given a mechanical cleaning.

Zaremba Co., Buffalo, U. S. A.

New York Office: 95 Liberty St.

24 Autoclave Diffusion Cells;

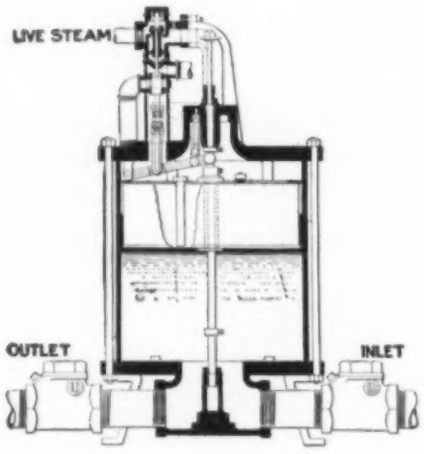
one installation for extracting Tannin

Superior Quality Business

The Pusey & Jones Company

Wilmington - - - - Delaware

The Perfect Drainer for Evaporators



To get the maximum capacity from Multiple Effect Evaporators the condensation from the Steam Chest must be removed instantly, without effecting the vacuum. This result can be obtained by installing on the effects

Lytton Perfect Vacuum and Lifting Traps

Patent Pending

No oiling, no packing, very little attention, self-contained, no vibration or slip like a pump. Will drain any vacuum that can be produced. Made in sizes with capacities from ½ to 30 tons per hour.

Write for Bulletin No. 10.

Lytton Manufacturing Corporation

Sales Office: 50 Church St., New York **Main Office and Works: Franklin, Va.**

Repeat Orders

Aluminum Company of America ordered their first KESTNER QUADRUPLE EFFECT in March, 1910

Aluminum Company Of America

E. S. FICKES

Pittsburgh, Mch. 3, 1911.

KESTNER EVAPORATOR CO.,
Philadelphia, Pa.

Gentlemen,

We have just finished a three months' test on the quadruple effect evaporator which you recently installed for us and are much gratified to find that its actual working capacity is over 50 per cent. greater than its rated capacity. It is by far the most satisfactory evaporator we have ever used for soda and caustic liquors and its performance up to date has left nothing to be desired.

No small part of the success of this installation is due to the careful attention which you gave to the details and, considering the result, please accept ou thanks and congratulations.

Yours very truly,
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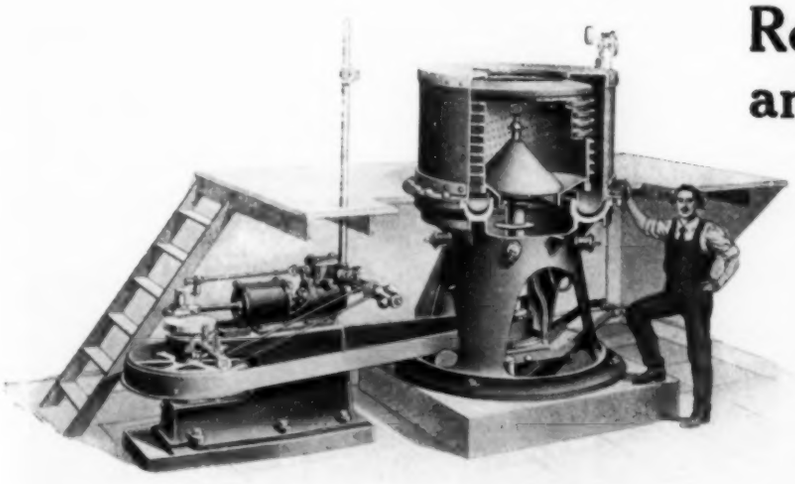

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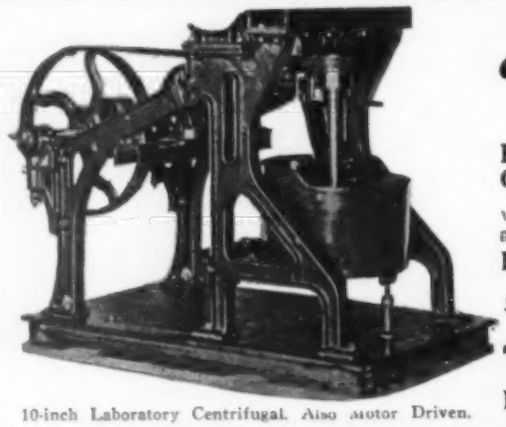

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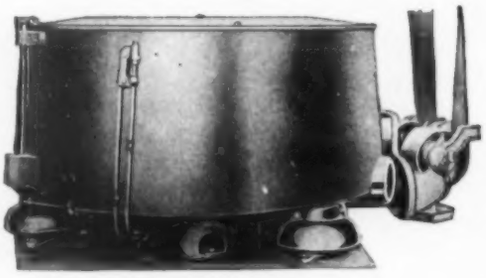

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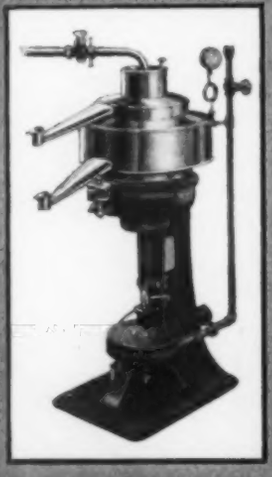

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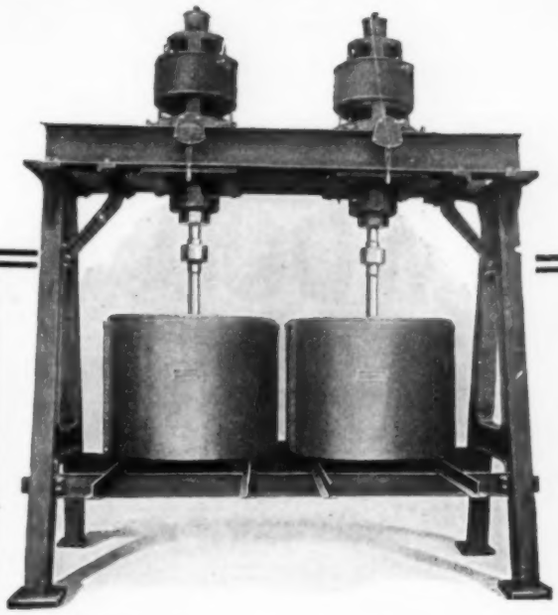

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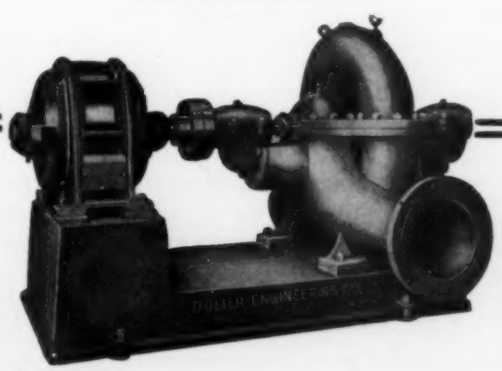

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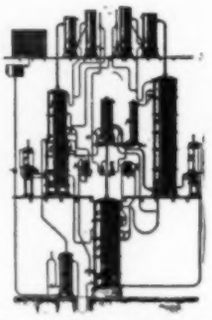

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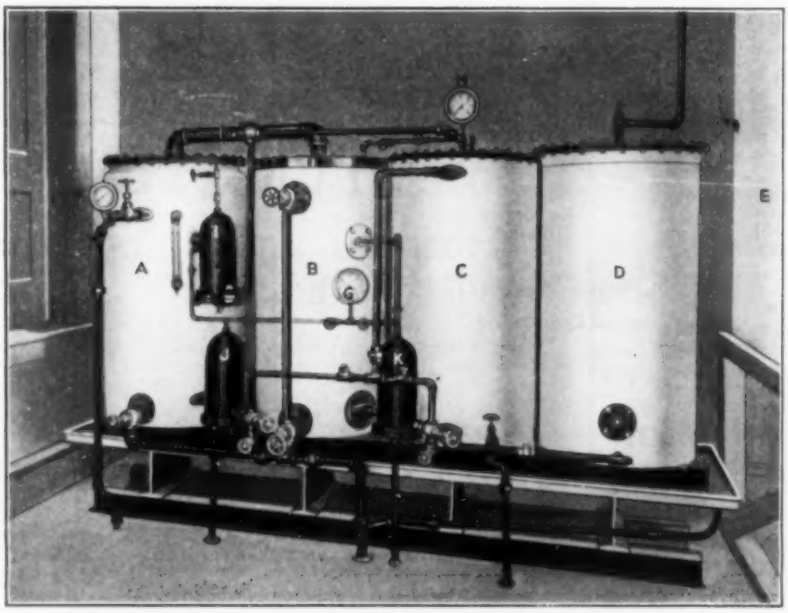

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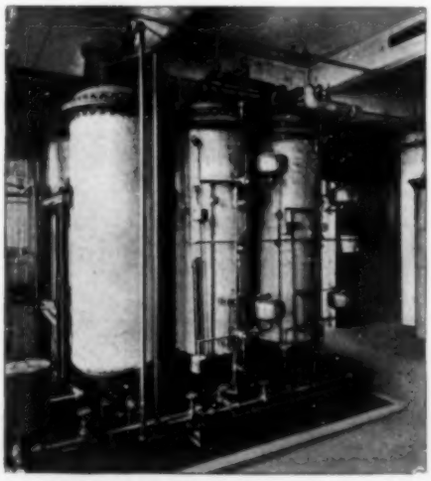

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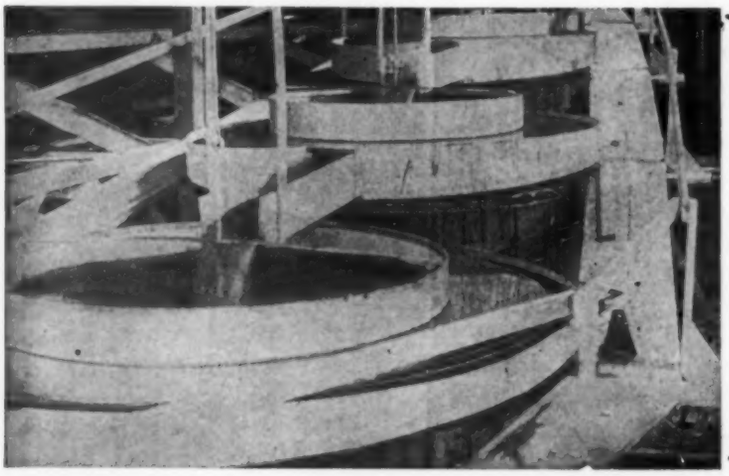

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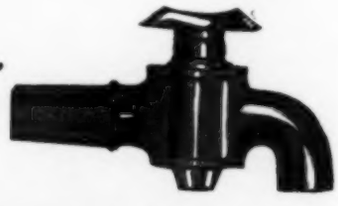

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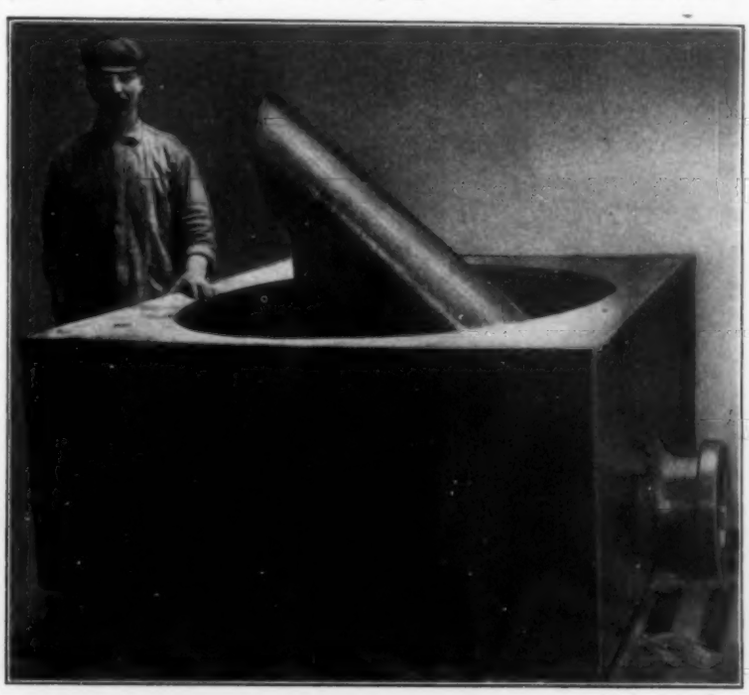

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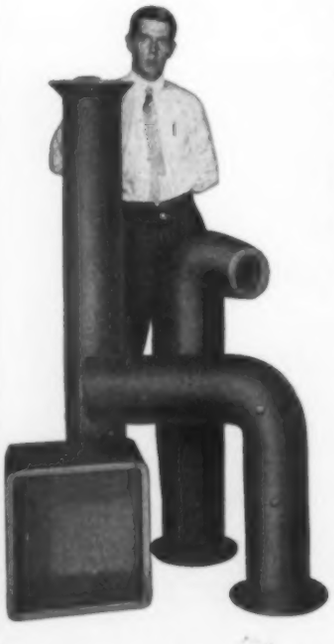

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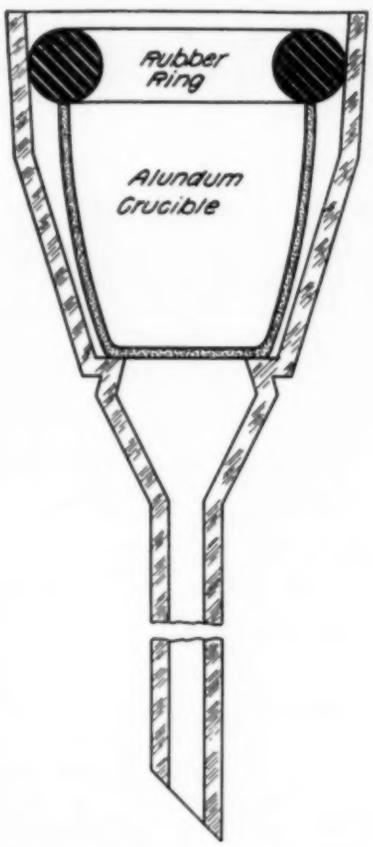

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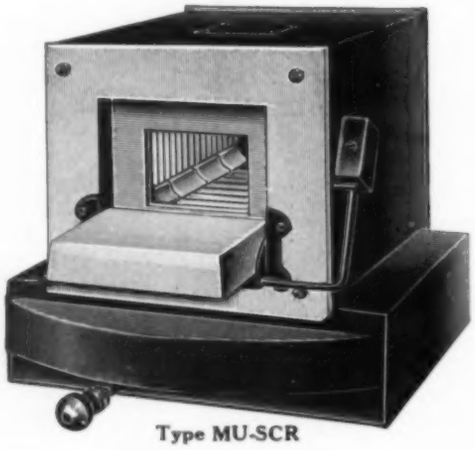

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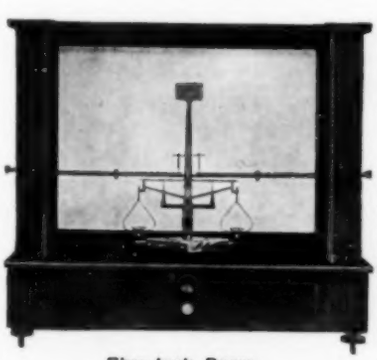

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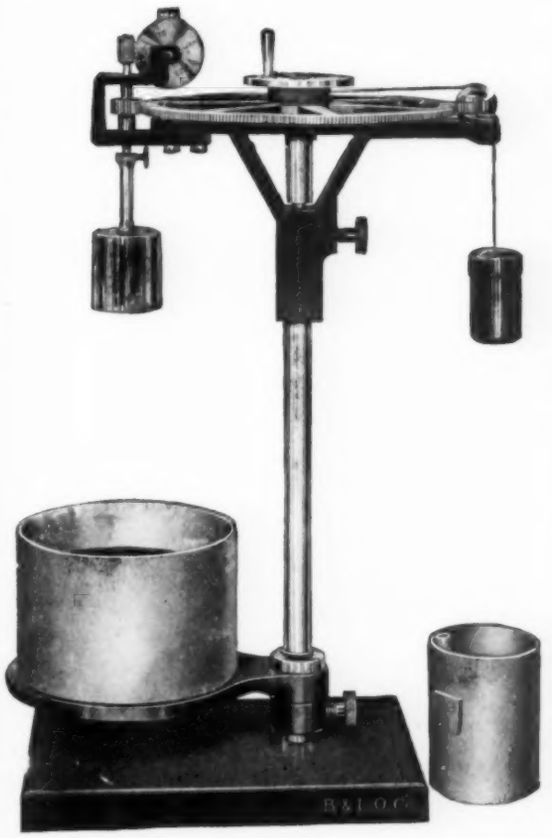

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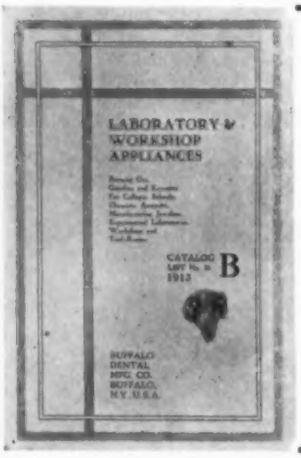

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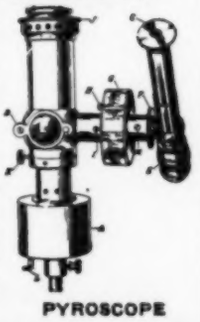
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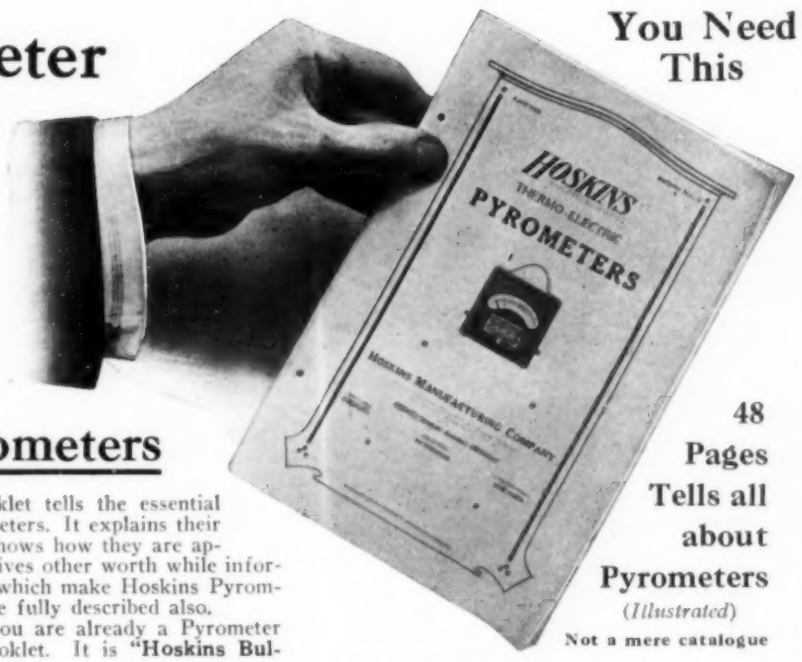

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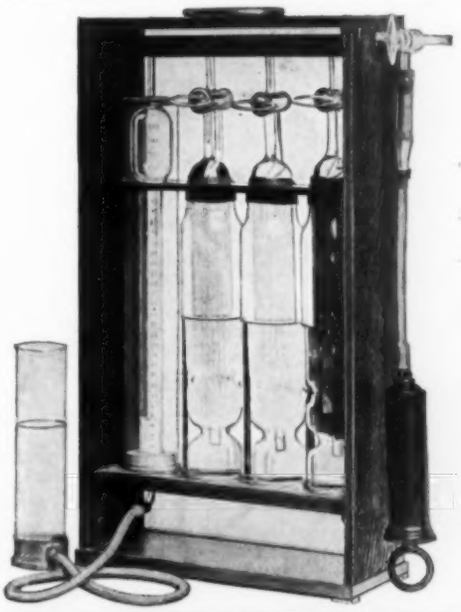

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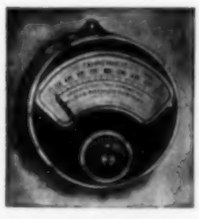

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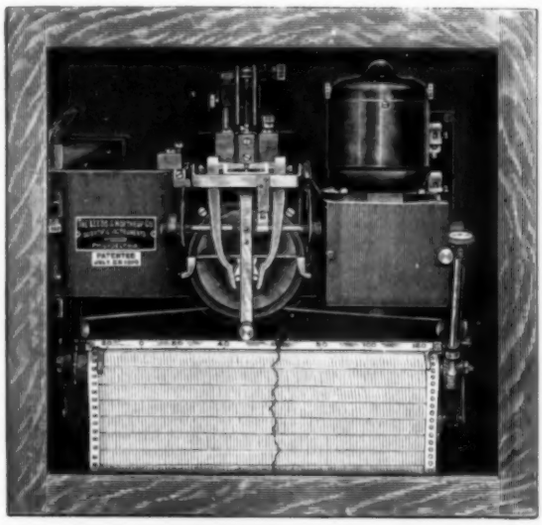

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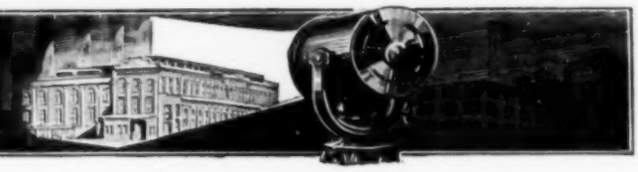

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Metallurgical and Chemical Engineering

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Business Manager: J. M. Muir, New York, N. Y.

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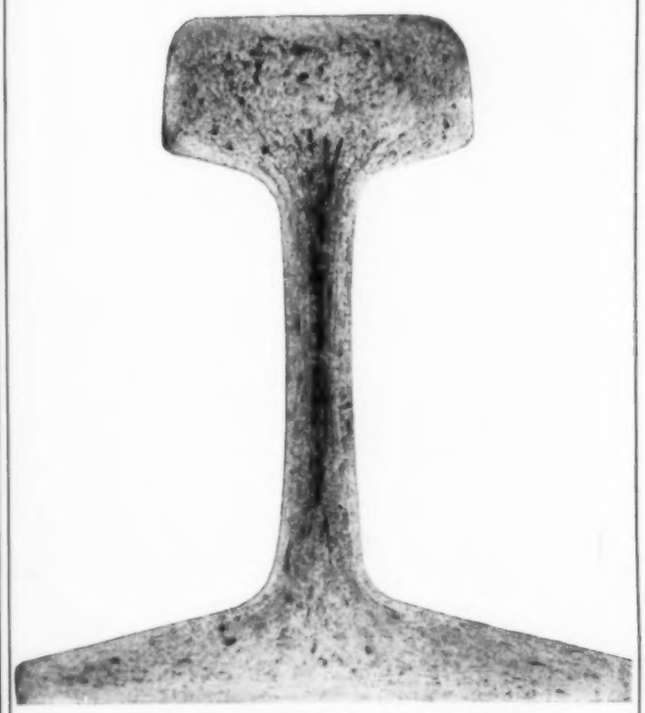

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"0.10 Titanium"

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A Comparison of Chemical Analyses and Sulphur Prints

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	Ladle Test	Top of Head	Center of Head	Web	Flange
C.	.71	.64	.75	.88	.73
Mn.	.84	.784	.901	.816	.790
P.	.034	.019	.026	.044	.020
S.	.028	.032	.050	.069	.038
Si.	.12	.137	.145	.150	.145

Carbon, Phosphorus and Sulphur are all above specification limits in Web of untreated Rail.

Titanium Treated Open Hearth A-Rail

	Ladle Test	Top of Head	Center of Head	Web	Flange
C.	.65	.62	.64	.67	.63
Mn.	.70	.659	.646	.690	.666
P.	.015	.016	.016	.022	.016
S.	.044	.029	.030	.038	.032
Si.	.07	.080	.075	.080	.077

Note uniformity of Carbon, Phosphorus and Sulphur throughout treated Rail.

If excessive segregation in rail steel is dangerous, the use of Ferro Carbon Titanium is imperative

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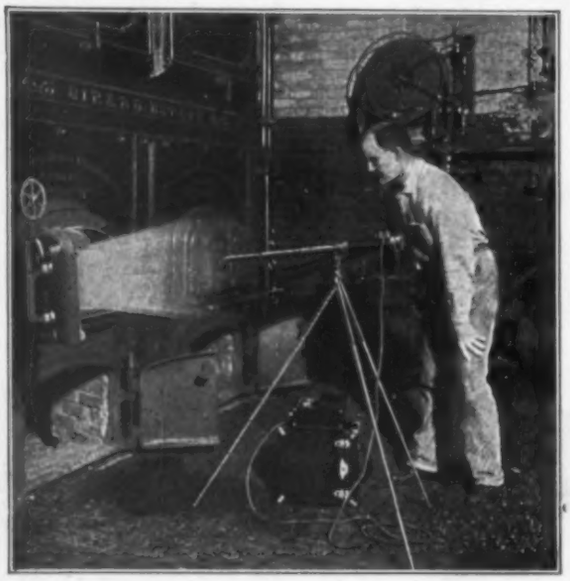

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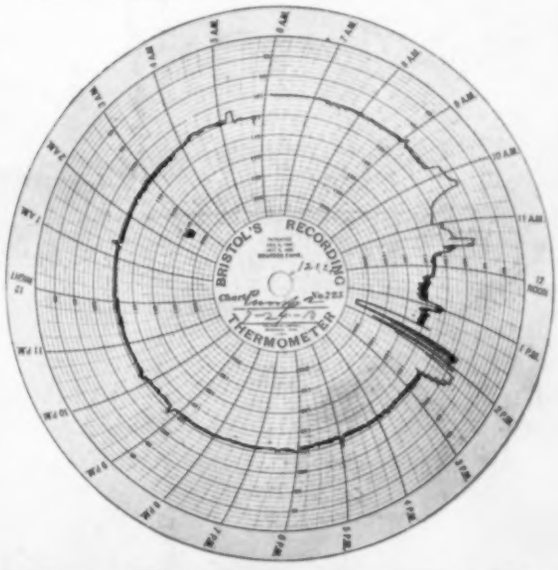

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